DC-FR-1054

ANALYSIS OF JAPANESE NUCLEAR CASUALTY DATA

L. Wayne Davis
William L. Baker
Donald L. Summers

Final Report
on
Contract Nos. OCD-PS-64-196 and N228-(62479)69778
(Work Unit No. 3411A)

Sponsored by

OFFICE OF CIVIL DEFENSE
OFFICE OF THE SECRETARY OF THE ARMY

through

TECHNICAL MANAGEMENT OFFICE
U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY

April, 1966

OCD REVIEW NOTICE

This report has been reviewed in the Office of Civil Defense and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Office of Civil Defense.

DDC AVAILABILITY NOTICE

Distribution of this Document is Unlimited

THE DIKEWOOD CORPORATION
1009 Bradbury Drive, S. E.
University Research Park
Albuquerque, New Mexico 87106

USNRDL-TRC-46

ACKNOWLEDGMENT

The authors wish to acknowledge the major effort contributed by Mr. Francis X. Lynch, formerly in charge of the A-Bomb Unit at the Armed Forces Institute of Pathology, in supervising the coding of almost one-half of the Japanese casualty data. Others deserving special mention for their instigation and support of this effort are Mr. L. J. Deal of the Atomic Energy Commission; Mr. Jack C. Greene and Mr. William J. Lacy of the Office of Civil Defense; Dr. Carl F. Miller, formerly with OCD; Mr. John A. Auxier of the Oak Ridge National Laboratory; General Joe M. Blumberg, Director of the Armed Forces Institute of Pathology; and Mr. W. H. Ellett, technical monitor for the U. S. Naval Radiological Defense Laboratory.

ABSTRACT

This report summarizes the results of a detailed data reduction and casualty study made on over 35,000 persons who were subjected to the nuclear attack on Hiroshima and Nagasaki, Japan, in 1945. Both graphical and tabular presentations are made of pertinent data to show that an excellent base exists for more reliable conclusions of a wider variety than have heretofore been available.

Total mortality and total injury curves are given as well as injury curves by type (blast, thermal, and initial nuclear) for thirteen shielding categories, which includes a breakdown of seismic reinforced-concrete buildings by floor divisions. Further breakdowns of the blast and thermal injuries are also given here, but considerably greater detail will be presented in a follow-on effort directed towards predicting the medical load following a high-yield nuclear attack on the United States. The free-field weapons effects are presented for both Japanese cities to allow the association of a given effects level with a particular percent mortality or injury. ( ) Such comparisons indicate that the initial nuclear radiation played a dominant role in the deaths of thermally-shielded people in both cities.

Other post-attack data are given for those persons killed immediately, those rescued by others, those who survived in the fire, and the time to death of those who were killed. Numerous other investigations could be made on the vast storehouse of information that has been collected on magnetic tape during the course of this project.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

APPENDIXES

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Continued)

LIST OF ILLUSTRATIONS (Continued)

LIST OF ILLUSTRATIONS (Continued)

LIST OF ILLUSTRATIONS (Continued)

DC-FR-1054

ANALYSIS OF JAPANESE NUCLEAR CASUALTY DATA

L. Wayne Davis
William L. Baker
Donald L. Summers

Summary
of
Contract Nos. OCD-PS-64-196 and N228-(62479)69778
(Work Unit No. 3411A)

Sponsored by

OFFICE OF CIVIL DEFENSE
OFFICE OF THE SECRETARY OF THE ARMY

through

TECHNICAL MANAGEMENT OFFICE
U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY

April, 1966

THE DIKEWOOD CORPORATION
1009 Bradbury Drive, S. E.
University Research Park
Albuquerque, New Mexico 87106

USNRDL-TRC-46

ANALYSIS OF JAPANESE NUCLEAR CASUALTY DATA

SUMMARY

Work on urban casualty prediction using the Japanese data began several years ago under Contract No. OCD-OS-62-203 for the Office of Civil Defense. This effort was based on the Joint Commission reports, a six-volume series on the Medical Effects of Atomic Bombs, published by the Army Institute of Pathology in 1951. During that effort sufficient discrepancies and errors arose in the published data to make its accuracy questionable. It was decided then that a major reanalysis of the Japanese data should be undertaken. That attempt is now being made utilizing a considerably enlarged raw data source which also allows the results to be subdivided into a larger number of shielding categories.

The development of the coding system is described in Chapter II. The coding format showing all of the possible entries is given in Appendix A. Five IBM cards were punched for each of 35, 099 case histories, and all of the data were transferred to magnetic tape for processing and storage.

Chapter III presents the geographical distribution by shielding category of 19, 274 case histories available by location coordinates. These figures give an excellent visual representation of where and how many of these case histories were available for analysis. It can be seen that the coverage was very good except for ranges near the hypocenter where one would expect the data to be scarce. A similar presentation was not made for the other 15, 825 case histories due to the coarse coordinates used in originally recording the data.

A summary of the casualty data for specific buildings is described in Chapter IV and presented in detail in Appendices B through E. (The construction details are given in Appendices B and C, and the associated casualty figures are given in Appendices D and E.) It was felt that many people would want to examine some of the data that went into the curves to be described later. To present all of the data would require huge volumes and would be impractical.

Data on thermal injuries are presented in Chapter V. These results were also used to compute the nuclear yields associated with both Japanese cities. The results for Hiroshima were very good and agreed well with the accepted yield of 12. 5 kt. However, the results for Nagasaki did not substantiate the accepted yield of 22 kt. Errors in the transmissivity assumed over Nagasaki could explain the deviation in the thermal calculations.

Chapter VI gives the free-field weapons effects calculated for Hiroshima and Nagasaki. Neutron, gamma, and total initial nuclear radiation are presented as well as the overpressure and thermal radiation. These figures allow one to associate a weapons effects level with a particular percent mortality or injury as given in Chapter VII. Detailed study of these curves indicates that the initial nuclear radiation played a dominant role in the deaths of thermally-shielded people in both cities, especially in the high mortality regions. It also explains why the associated total mortality curves by shielding category (plotted as a function of range) do not differ greatly in the two cities, a fact that has been puzzling for many years.

The mortality and injury curves developed from the raw data for Hiroshima and Nagasaki are presented in Chapter VII. These curves are probably the most important result of this study. Total mortality and total injury curves are given as well as injury curves by type (blast, thermal, and initial nuclear) for the following shielding categories: seismic reinforced-concrete buildings (entire building, basements, lower floors, middle floors, and upper floors), nonseismic reinforced-concrete buildings, light steel-frame industrial buildings, wood-frame commercial buildings, wood-frame dwellings, vehicles (mostly street cars), miscellaneous underground shelters, outside-shielded (by light buildings), and outside-unshielded. Several additional categories have been added to the data previously available, and their reliability has been greatly improved. It appears that people in several categories were less vulnerable to being killed than previously thought.

Chapter VIII gives a summary in tabular form of the types of blast injuries as a function of range interval. These percentages must be applied to the blast injury curves given in Chapter VII to find the actual percentages. Five principal types of blast injuries are given as follows: cuts, lacerations, and punctures; contusions and abrasions; simple fractures; ruptured eardrums; and impairment of consciousness. The most prevalent type of blast injury received fell into the category of cuts, lacerations, and punctures. No data exist on internal injuries due to blast except perhaps from a few autopsies. (Additional injury breakdowns pertinent to the medical load are being examined under a follow-on contract.)

Other post-attack data are presented in Chapter IX. Information is given on those persons killed immediately, those rescued by others, those who survived in the fire, and the time to death of those who were killed. These items are also of importance in determining the medical load in the post-attack period.

Quantitative <u>estimates</u> of the accuracy of the Japanese data are presented in Chapter X. A strict statistical analysis was not made since many non-quantitative factors could not be properly considered.

CHAPTER I

INTRODUCTION AND SUMMARY

Work on this project was sponsored by two separate government agencies under Contract No. AT(29-2)-1633 for the Atomic Energy Commission (AEC) and originally under Contract No. OCD-PS-64-196 (Work Unit No. 3411A) for the Office of Civil Defense (OCD). The latter contract was extended for OCD by their technical monitor, the U. S. Naval Radiological Defense Laboratory (NRDL), as Contract No. N228-(62479)69778. The results of this work are presented in reports distributed both by the Atomic Energy Commission and by the Office of Civil Defense.

Work on urban casualty prediction using the Japanese data began several years ago under Contract No. OCD-OS-62-203 for OCD. This effort was based on the Joint Commission reports, a six-volume series on the Medical Effects of Atomic Bombs, published by the Army Institute of Pathology in 1951. During that effort sufficient discrepancies and errors arose in the published data to make its accuracy questionable. One of the major errors was the mislabeling of the construction of the Hiroshima Post Office and the listing of erroneous casualty figures for the structure. It was decided then that a major reanalysis of the Japanese data should be undertaken. That attempt is now being made utilizing a considerably enlarged raw data source.

The development of the coding system is described in Chapter II. The coding format showing all of the possible entries is given in Appendix A. Five IBM cards were punched for each of 35, 099 case histories, and all of the data were transferred to magnetic tape for processing and storage.

Chapter III presents the geographical distribution by shielding category of 19, 274 case histories available by location coordinates. These figures give an excellent visual representation of where and how many of these case histories were available for analysis. It can be seen that the coverage was very good except for ranges near the hypocenter where one would expect the data to be scarce. A similar presentation was not made for the other 15, 825 case histories due to the coarse coordinates used in originally recording the data.

A summary of the casualty data for specific buildings is described in Chapter IV and presented in detail in Appendices B through E. (The construction details are given in Appendices B and C, and the associated casualty figures are given in Appendices D and E.) It was felt that many people would want to examine the data that went into the curves to be described later. To present all of the data would require huge volumes and would be impractical.

Data on thermal injuries are presented in Chapter V. These results are also used to compute the nuclear yields associated with both Japanese cities. The results for Hiroshima were very good and agreed well with the accepted yield of 12.5 kt. However, the results for Nagasaki did not substantiate the accepted yield of 22 kt. Errors in the transmissivity over Nagasaki could explain the deviation in the thermal calculations.

Chapter VI gives the free-field weapons effects calculated for Hiroshima and Nagasaki. Neutron, gamma, and total initial nuclear radiation are presented as well as the overpressure and thermal radiation. These figures allow one to associate a weapons effects level with a particular percent mortality or injury as given in the next chapter. Detailed study of these curves indicates that the initial nuclear radiation played a dominant role in the deaths of thermally-shielded people in both cities. It also explains why the associated total mortality curves by shielding category do not differ greatly in the two cities, a fact that has been puzzling for many years.

The mortality and injury curves developed from the raw data for Hiroshima and Nagasaki are presented in Chapter VII. These curves are probably the most important result of this study. Total mortality and total injury curves are given as well as injury curves by type (blast, thermal, and nuclear) for the following shielding categories: seismic reinforced-concrete buildings (entire building, basements, lower floors, middle floors, and upper floors), nonseismic reinforced-concrete buildings, light steel-frame industrial buildings, wood-frame commercial buildings, wood-frame dwellings, vehicles (mostly street cars), miscellaneous underground shelters, outside-shielded (by light buildings), and outside-unshielded. Several additional categories have been added to the data previously available, and their reliability has been greatly improved. It appears that people in several categories were less vulnerable to being killed than previously thought. It is hoped that the breakdown of seismic reinforced-concrete structures by floor categories will allow the prediction of casualties in basements and middle floors of national fallout shelter buildings.

Chapter VIII gives a summary in tabular form of the types of blast injuries as a function of range interval. These percentages must be applied to the blast injury curves given in Chapter VII to find the actual percentages. Five principal types of blast injuries are given as follows: cuts, lacerations, and punctures; contusions and abrasions; simple fractures; ruptured eardrums; and impairment of consciousness. The most prevalent type of blast injury received fell into the category of cuts, lacerations, and punctures. No data exist on internal injuries due to blast except perhaps from a few autopsies.

Other post-attack data are presented in Chapter IX. Information is given on those persons killed immediately, those rescued by others, those who survived in the fire, and the time to death of those who were killed. These items are of importance in determining the medical load in the post-attack period.

Quantitative estimates of the accuracy of the Japanese data are presented in Chapter X. A strict statistical analysis was not made since many non-quantitative factors could not be properly considered.

Dikewood will follow this effort with work on the medical-load problem. In addition, the casualty data as obtained from Japan will be scaled by shielding category for use at high yields. The results should offer more reliability in a finer breakdown of casualties than has heretofore been available.

Additional work may be undertaken to locate precisely particular individuals in specific heavy buildings. The construction and shielding would also be studied to allow the calculation of the initial nuclear radiation reaching each person.

Numerous other investigations could be made on the vast storehouse of information that has been collected on magnetic tape during the course of this project. The items which were recorded on tape are described in detail in Appendix A.

CHAPTER II

DEVELOPMENT OF THE CODING SYSTEM

One important aspect of this study that required considerable thought and preplanning was the development of a comprehensive coding system. The system had to be versatile and complete, yet provide for brief and concise entries. Such a system was developed, and a copy of the coding format is contained in Appendix A.

The magnitude of the coding effort can be realized by noting the amount of data analyzed. Over twice as much data were available as originally used by the Joint Commission. The information pertaining to each individual in the original data was considered a case history. A total of 35, 099 case histories were coded from all sources. There were 24, 044 case histories for Hiroshima and 11, 055 for Nagasaki.

As stated earlier, in order to facilitate handling of this vast amount of data a comprehensive coding system was developed. There was one complete set of entries for each individual coded. Each person was assigned a master file number and was located, if possible, by the map coordinates in the city of exposure. Knowing the coordinates for the hypocenter, the ground range was computed for each individual. Using this range, the free-field weapons-effects environment (blast overpressure, thermal radiation, and initial nuclear radiation) were then calculated for each individual. The shielding factors for the initial nuclear radiation were also coded when available.

Other items coded included the location of an individual at the time of the burst, his physical position (standing, sitting, etc.), and his particular shielding.

For individuals inside buildings, the information coded included building type, building construction, building use, building height (above and below ground), building damage, cause of damage, and general building shape. Items pertaining to the individual with respect to the building included location of the subject by floor; subject's position on that floor; relation of subject to exterior building openings; number of floors, walls, and other building features shielding the subject; and principal shielding material of these building features.

For individuals located in shelters, the items coded included the type of shelter, amount of concrete and/or earth shielding the subject, direction of the shelter opening with respect to the hypocenter, and location of the subject in the shelter with respect to these openings.

For individuals who were outside at the time of the bombing, information on the degree of shielding (total, partial, etc.) and on the material shielding the subject (terrain, wall, building, etc.) were coded.

Items of personal history such as age, sex, date of birth, date of death, cause of death, date of interview, and reliability of interview were also coded. Other entries pertaining directly to the individual that were coded included his occupation, reaction to the air-raid warning, medical condition prior to the burst, rescue, survival with respect to the fires, fire-fighting performed, and injuries sustained.

The information coded pertaining to rescue was as follows: rescue by whom; time to rescue; number of people exposed, trapped, and/or killed at the same location; direction of escape; and whether returned to the area. The following items were coded pertaining to survival with respect to the fire: first notice of the fire, cause of the fire, time elapsed until the fires merged, location of the subject with respect to the fire (including map coordinates for shelters within the fire area), condition of the shelter, and the range of the nearest burning building to the shelter. The items coded for fire fighting were as follows: fire-fighting efforts by subject or others, map coordinates locating the fire fighting, and the effects of the fire fighting.

The medical effects were more detailed. The entries included details on the type and severity of the mechanical injuries due to blast, burns due to thermal radiation and fires, and symptoms of nuclear radiation. Information regarding their medical treatment was also coded such as the dates of their treatment and discharge and their lowest counts for red blood cells, white blood cells, and hemoglobin.

Information on blast injuries which were coded included the nature of the mechanical injury (primary, secondary, etc.), type of injury (cuts, lacerations, contusions, fractures, etc.), and the severity of these injuries.

Information on thermal injuries which were coded included the type of burns, region burned, percent of total area burned, severity of burns, and burns in relation to clothing. Related items which were coded included the type of head covering worn and the number of layers and color of the clothing worn.

The nuclear-radiation symptoms which were coded included the type of symptom and the onset and duration of the symptoms.

Items of general information which were coded included a statement of whether a narrative was included, whether building plans were available, and whether an autopsy was performed.

These data were entered directly on a code sheet prepared for this study, and the sheet was used as a guide in punching the data on IBM cards. A total of five cards were required for each case history.

CHAPTER III

GEOGRAPHICAL DISTRIBUTION OF DATA BY SHIELDING CATEGORY*

In performing an analysis on a large amount of data, its distribution is of prime importance. The main factor governing the reliability of the results presented in this report is the distance from the hypocenter to the various sample groups. The geographical distribution by shielding category of 19,274 case histories available by location coordinates is presented in this section to acquaint the reader with the broad data base available for the analysis.

Each individual was located to the nearest ten yards using coordinates from the world polyconic grid system as given on the army map series AMS-L902 for Hiroshima and Nagasaki. Figure 1 is a clear plastic overlay of a reduced portion of the map for Hiroshima, and Fig. 2 is a clear plastic overlay of a reduced portion of the map for Nagasaki. (The figures are given at the end of this chapter.) Similar geographical distributions were not made for the other 15,825 case histories due to the coarse coordinates used in originally recording the data.

The following figures subdivide the two cities into one-hundred-yard squares. The entry in each square represents the total number of persons who said they were at that location at the time of the bombing. Figures 3 and 4 give the overall distribution of case histories for Hiroshima and Nagasaki for all shielding categories. The scaling of the maps on the plastic overlaps and on the distributions are identical.

Figures 5 through 12 give the distributions by shielding category for Hiroshima. The shielding categories for this city are as follows: seismic reinforced-concrete buildings, nonseismic reinforced-concrete buildings, light steel-frame industrial buildings, vehicles, outside and shielded by light buildings, wood-frame commercial buildings, wood-frame dwellings, and outside and unshielded. The distribution for the underground shelters for Hiroshima is not included as few shelters were in use at the time of the bombing.

Figures 13 through 20 give the distributions of persons by shielding category for Nagasaki. The same shielding categories given above apply except that the underground shelters have been added, and the vehicles have been omitted. (Little data exist for people in vehicles in Nagasaki.)

---

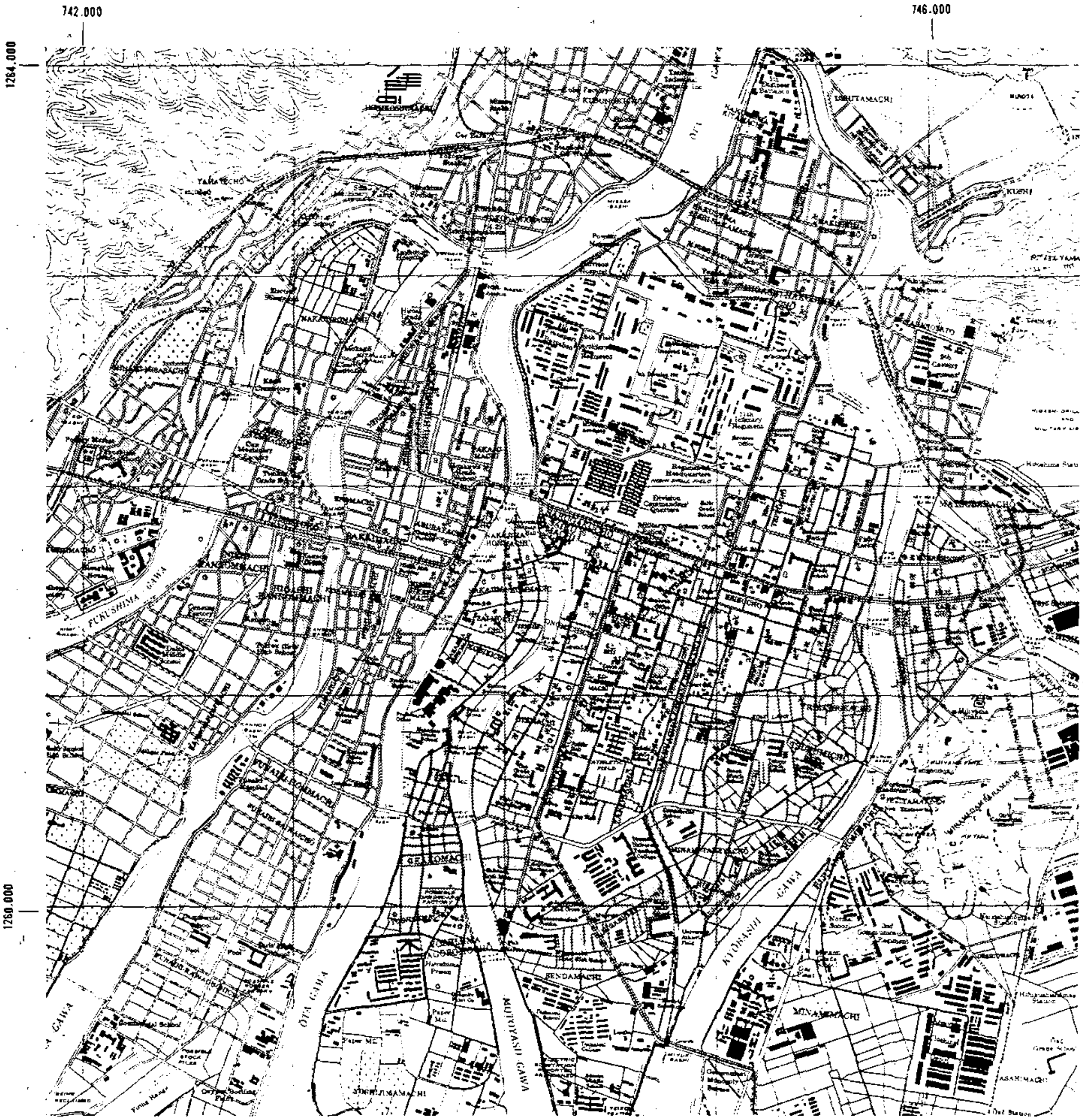
*Only those data available by location coordinates are presented here.

Figures 21 through 24 are presented to familiarize the reader with the data distribution on blast and thermal injuries (flash burns) for Hiroshima. The blast injury data are given for wood-frame dwellings, and the burn injury data are given for the outside-unshielded category. These distributions are presented for both moderate and severe injuries. A moderate blast injury is defined to be a single laceration, cut, abrasion, contusion, etc. (excluding minor injuries) or a simple fracture (not of a long bone). A severe blast injury is defined to be multiple lacerations, cuts, abrasions, contusions, etc.; fracture of one or more long bones (simple or compound); compound fracture of other bones; fracture of the skull; or fracture of the spine. A moderate flash burn is defined to be a burn of second degree over less than 10 percent of the skin area, and a severe burn is defined to be a burn of third degree over more than 2 percent of the skin area. (See Table 14 in Appendix A for the detailed criteria for severity of injury.)

Figures 25 and 26 present the data distribution for moderate blast and thermal injuries for Nagasaki so that comparisons of the injury distributions between the two cities can be made. Insufficient data for meaningful analysis is the principal reason for the omission of the severe injuries. The rough terrain of Nagasaki affected the distribution of both the blast and the thermal injuries. However, it should be pointed out that almost all of the data came from persons who were not shielded from the burst by the hills running through the city.

FIG. 1

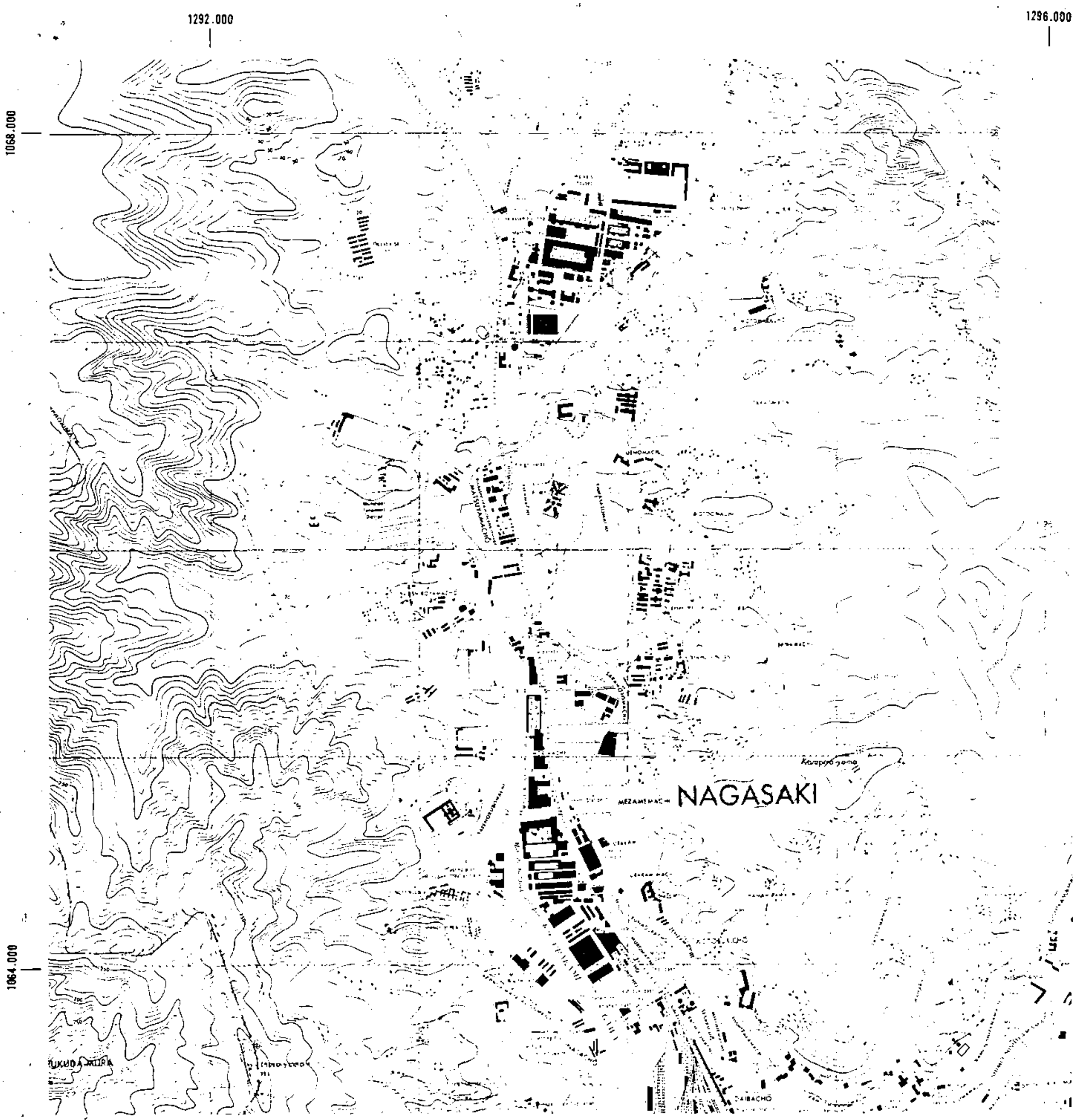
OVERLAY MAP OF HIROSHIMA



cut along dotted line

FIG. 2

OVERLAY MAP OF NAGASAKI



cut along dotted line

FIG. 3

GEOGRAPHICAL DISTRIBUTION OF DATA FOR HIROSHIMA
ALL SHIELDING CATEGORIES

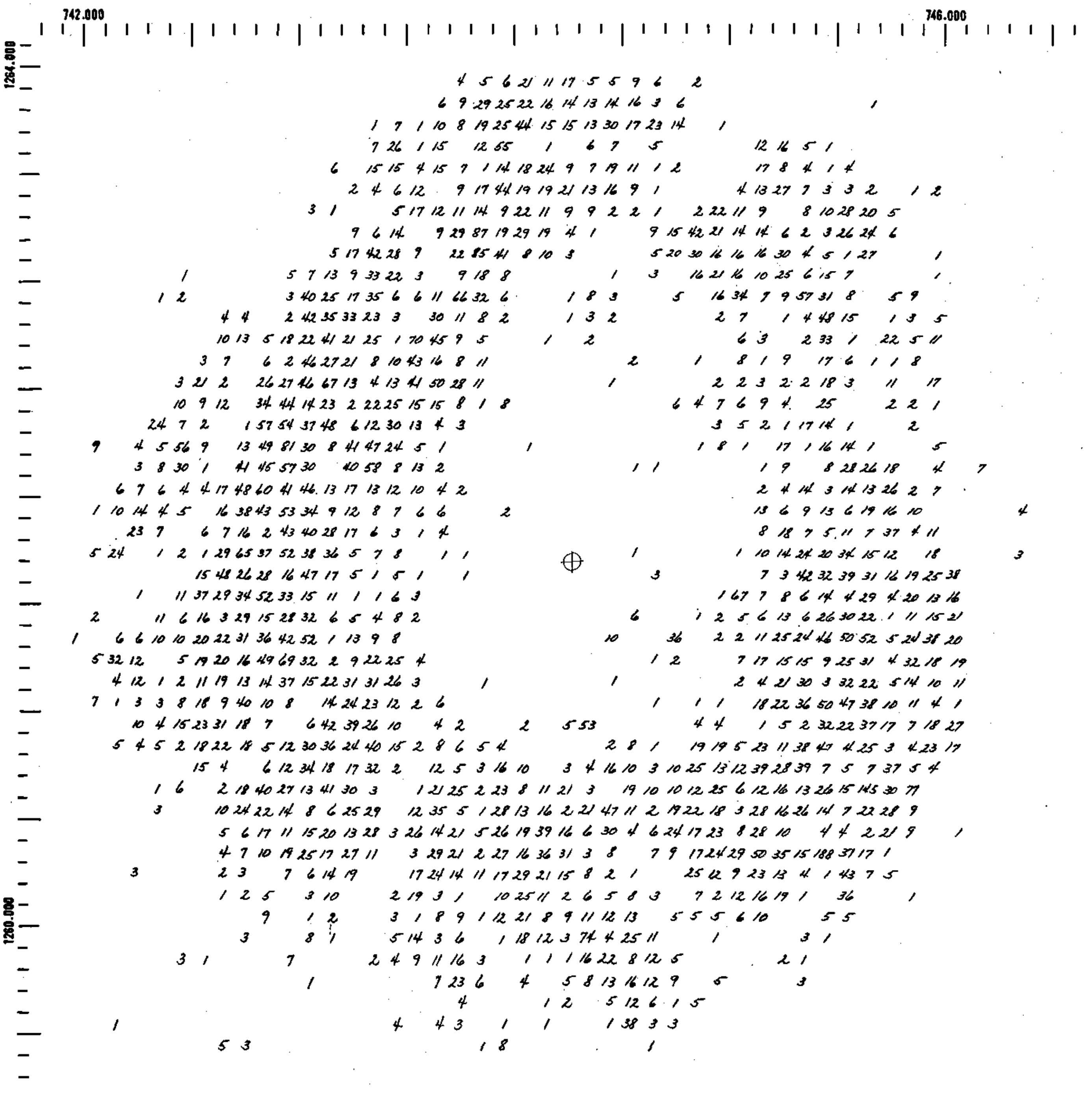


FIG. 4

GEOGRAPHICAL DISTRIBUTION OF DATA FOR NAGASAKI
ALL SHIELDING CATEGORIES

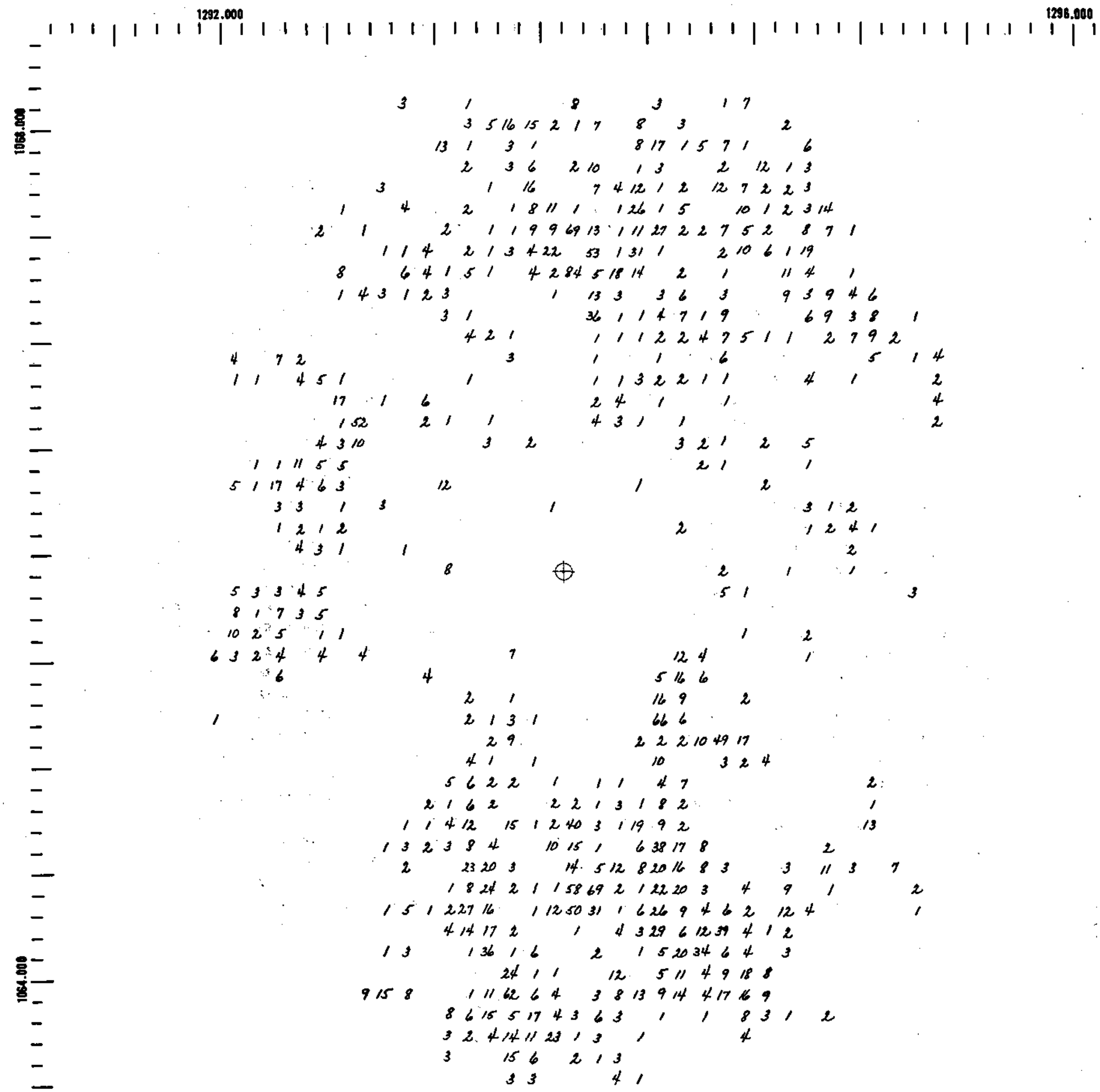


FIG. 5

GEOGRAPHICAL DISTRIBUTION OF DATA FOR HIROSHIMA
SEISMIC REINFORCED-CONCRETE BUILDINGS

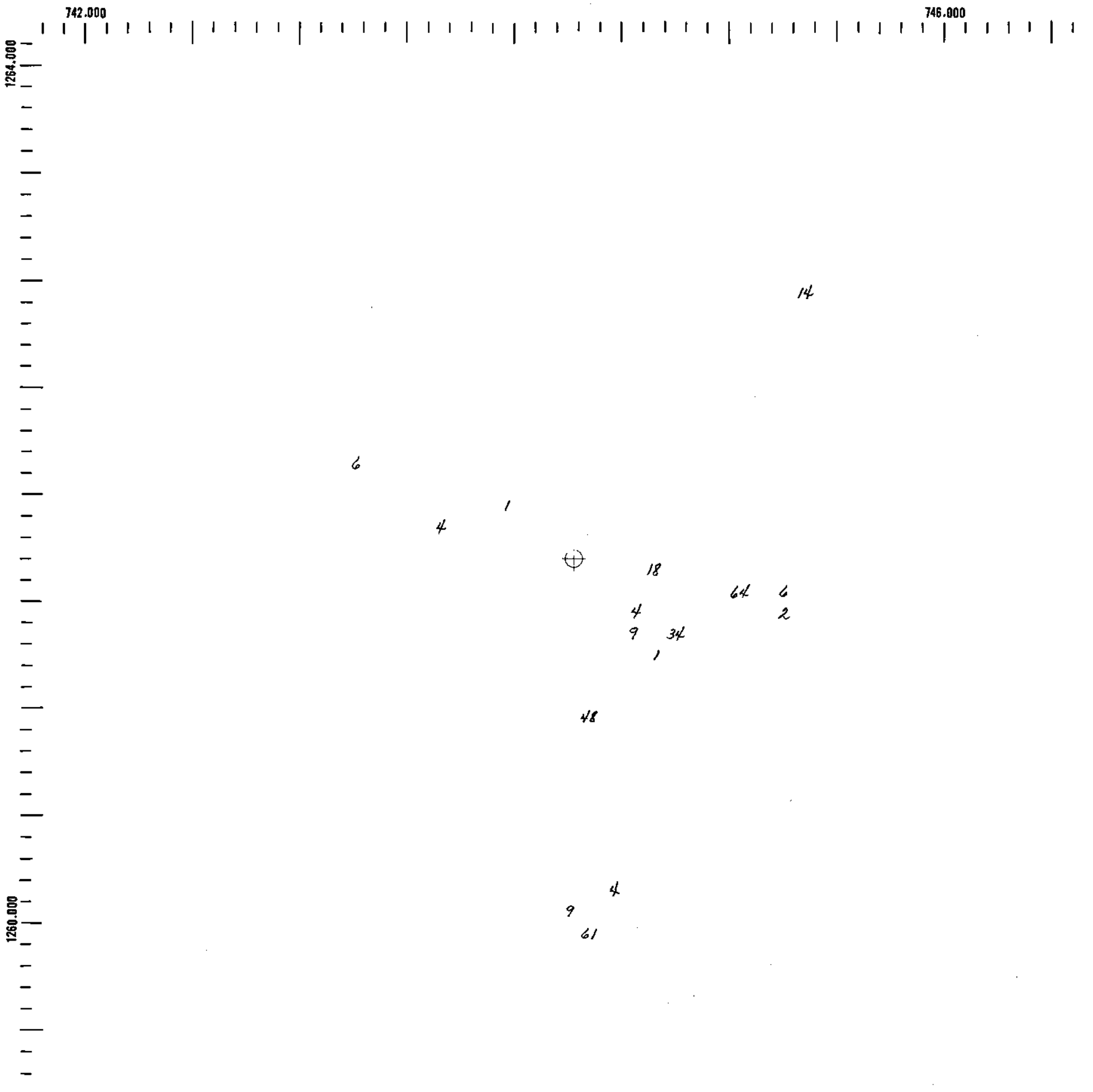


FIG. 6

GEOGRAPHICAL DISTRIBUTION OF DATA FOR HIROSHIMA
NONSEISMIC REINFORCED-CONCRETE BUILDINGS

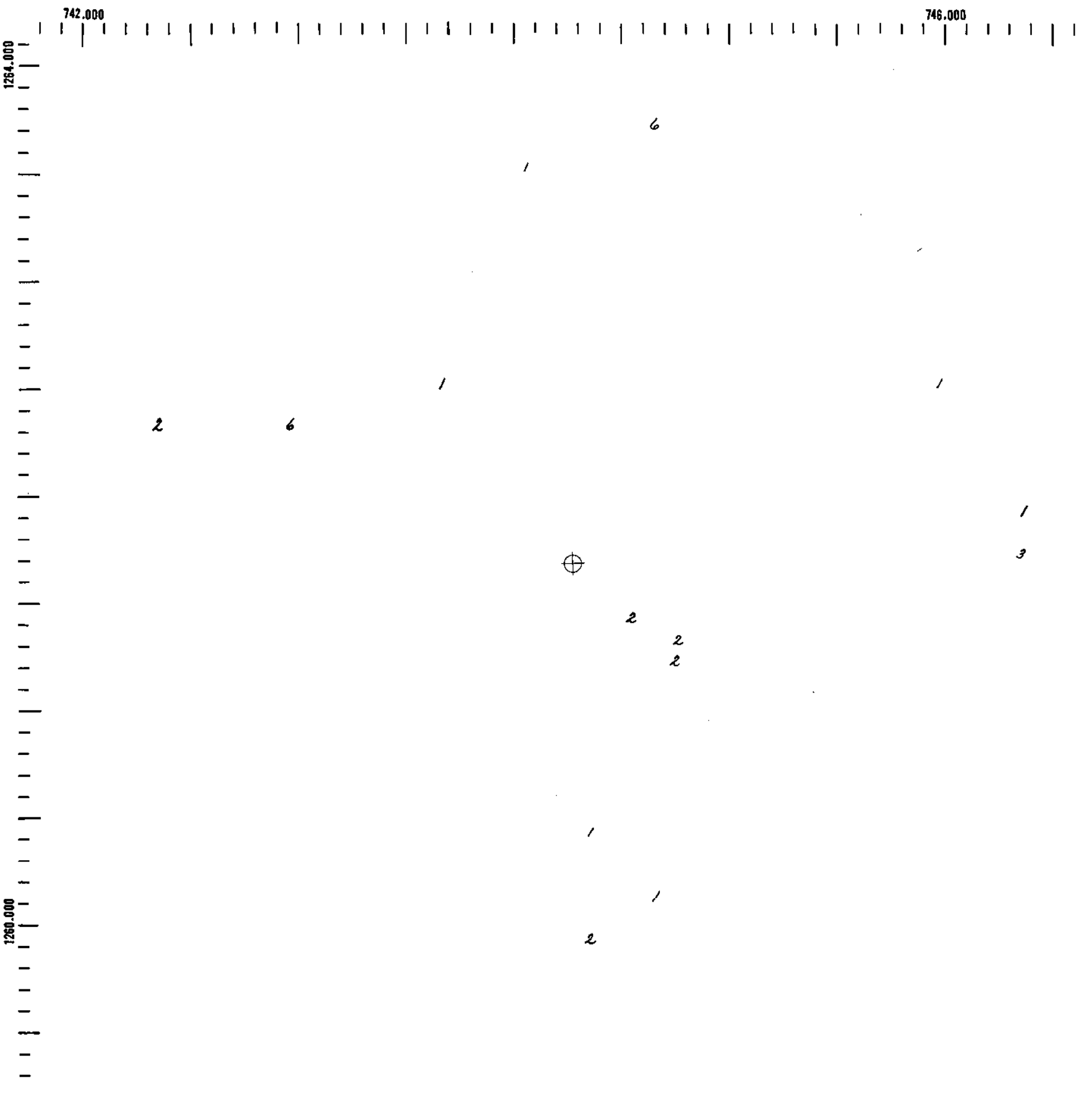


FIG. 7

GEOGRAPHICAL DISTRIBUTION OF DATA FOR HIROSHIMA
LIGHT STEEL-FRAME INDUSTRIAL BUILDINGS

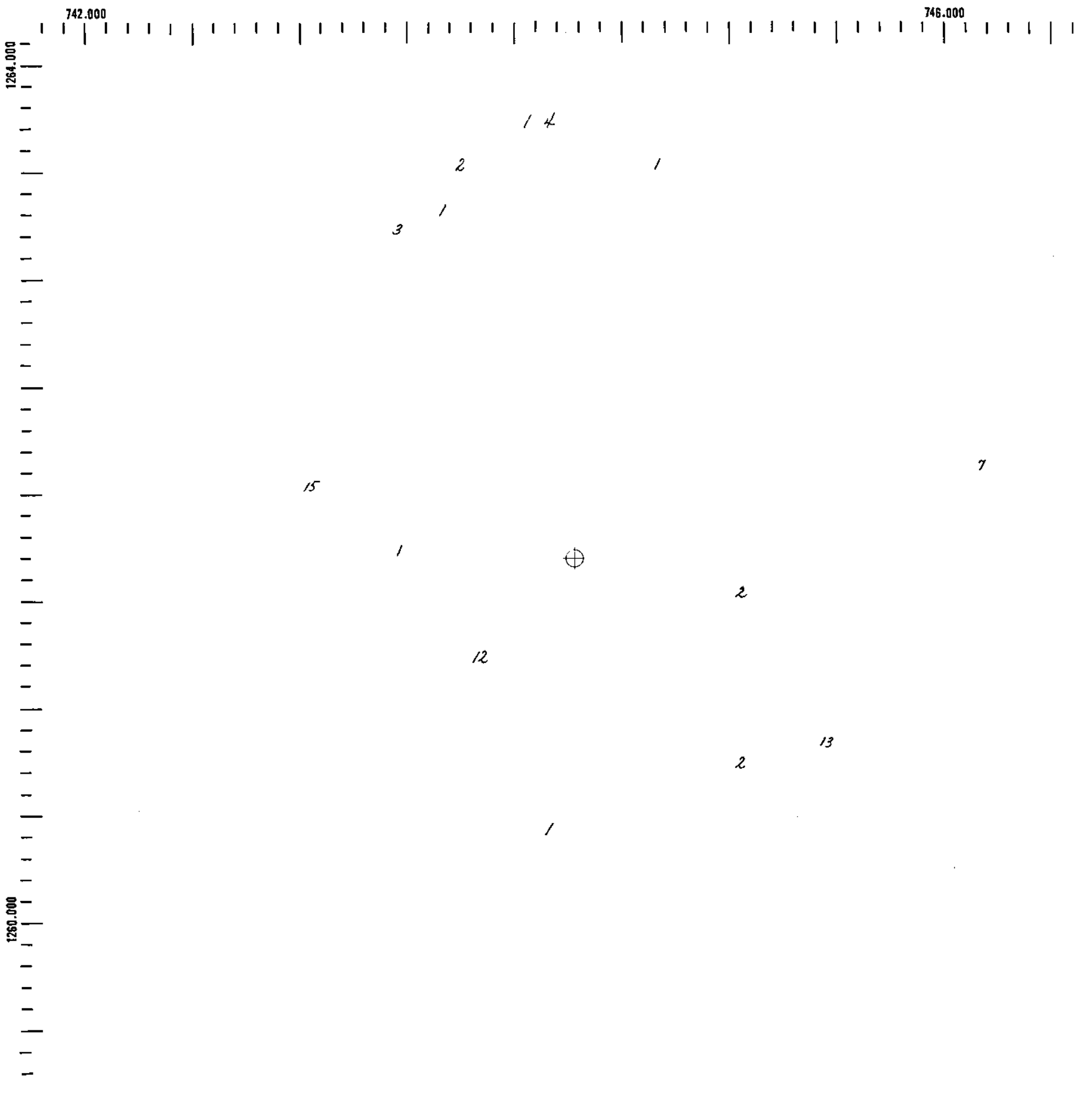


FIG. 8

GEOGRAPHICAL DISTRIBUTION OF DATA FOR HIROSHIMA VEHICLES

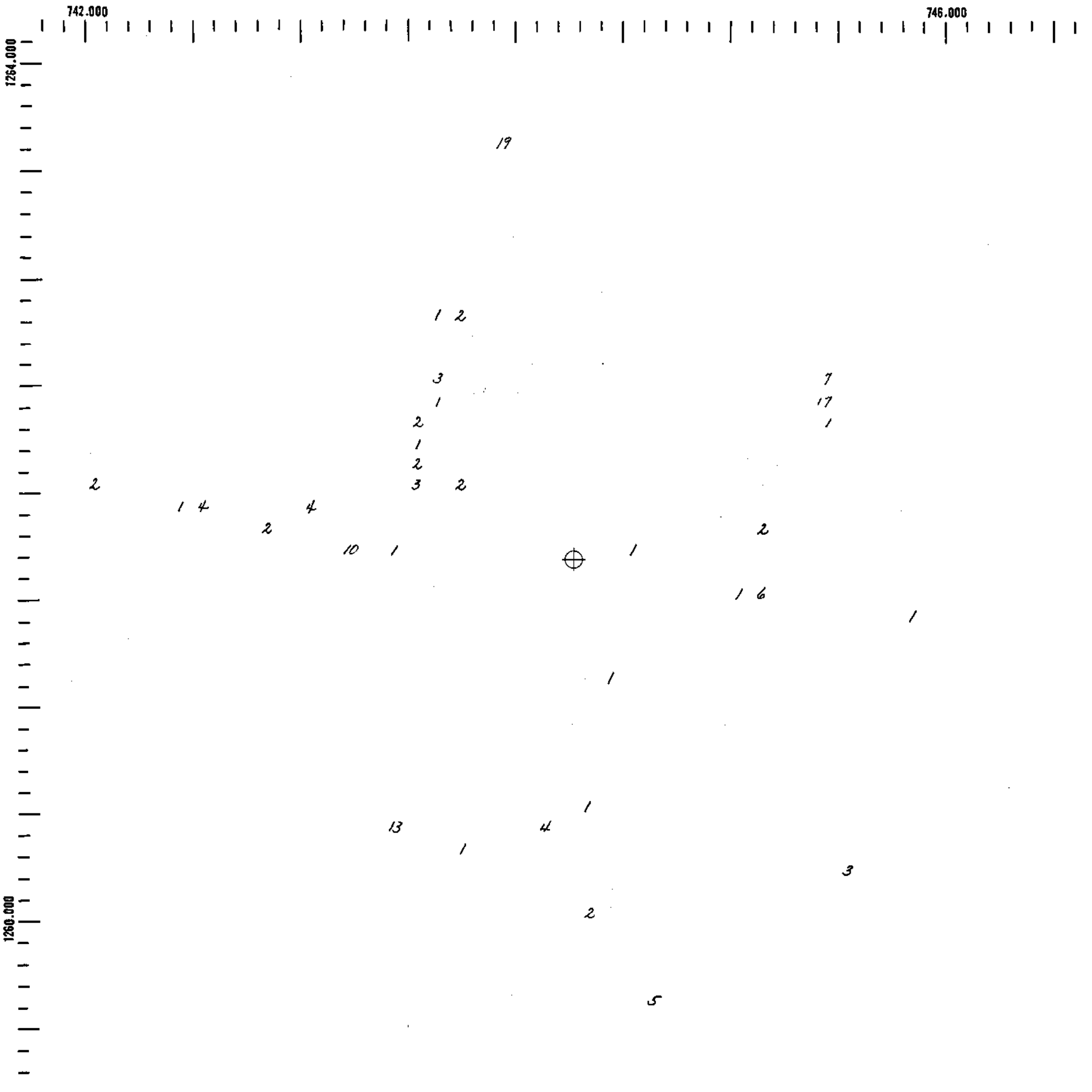


FIG. 9

GEOGRAPHICAL DISTRIBUTION OF DATA FOR HIROSHIMA
OUTSIDE SHIELDED BY LIGHT BUILDINGS

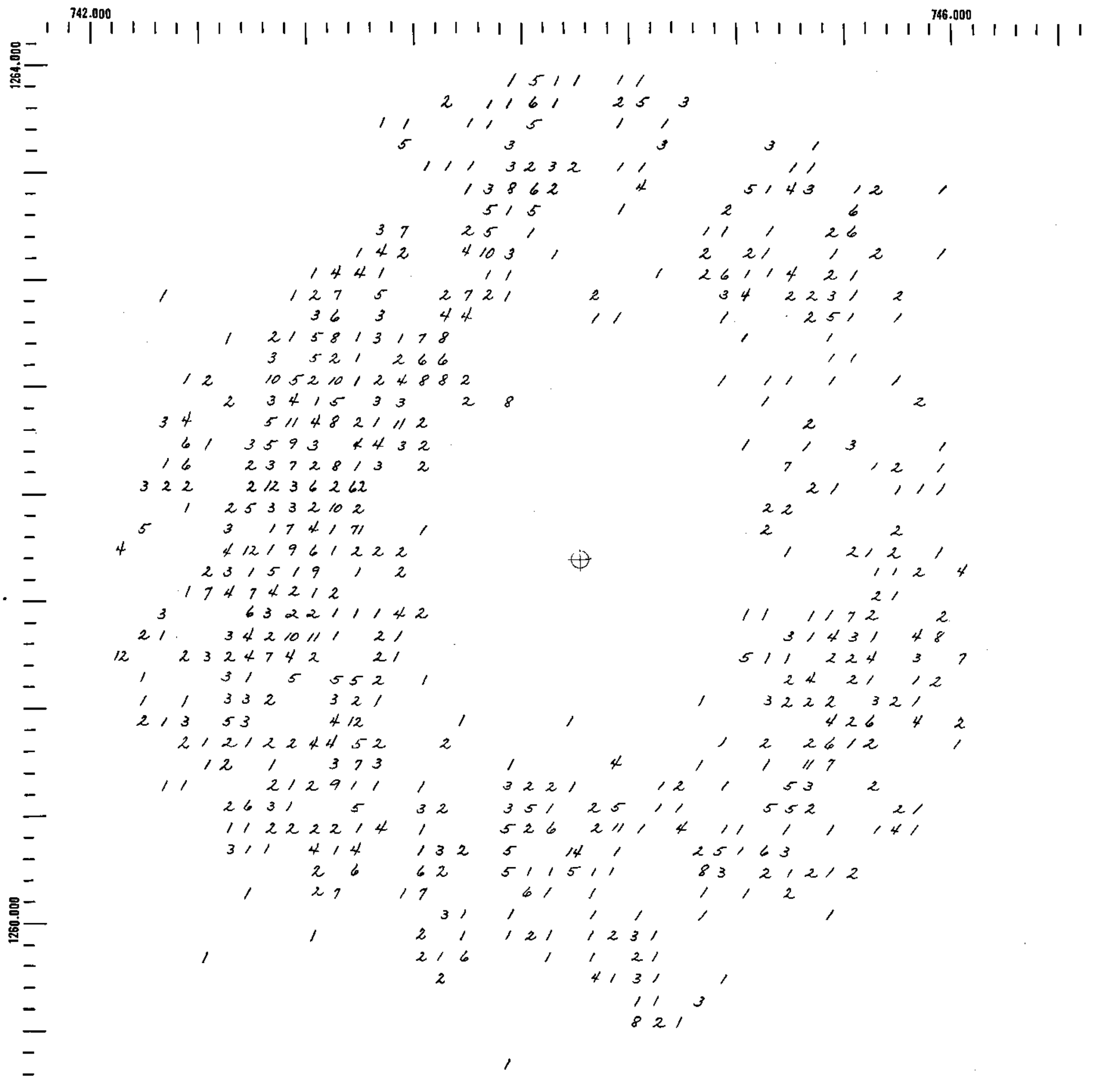


FIG. 10

GEOGRAPHICAL DISTRIBUTION OF DATA FOR HIROSHIMA
WOOD-FRAME COMMERCIAL BUILDINGS

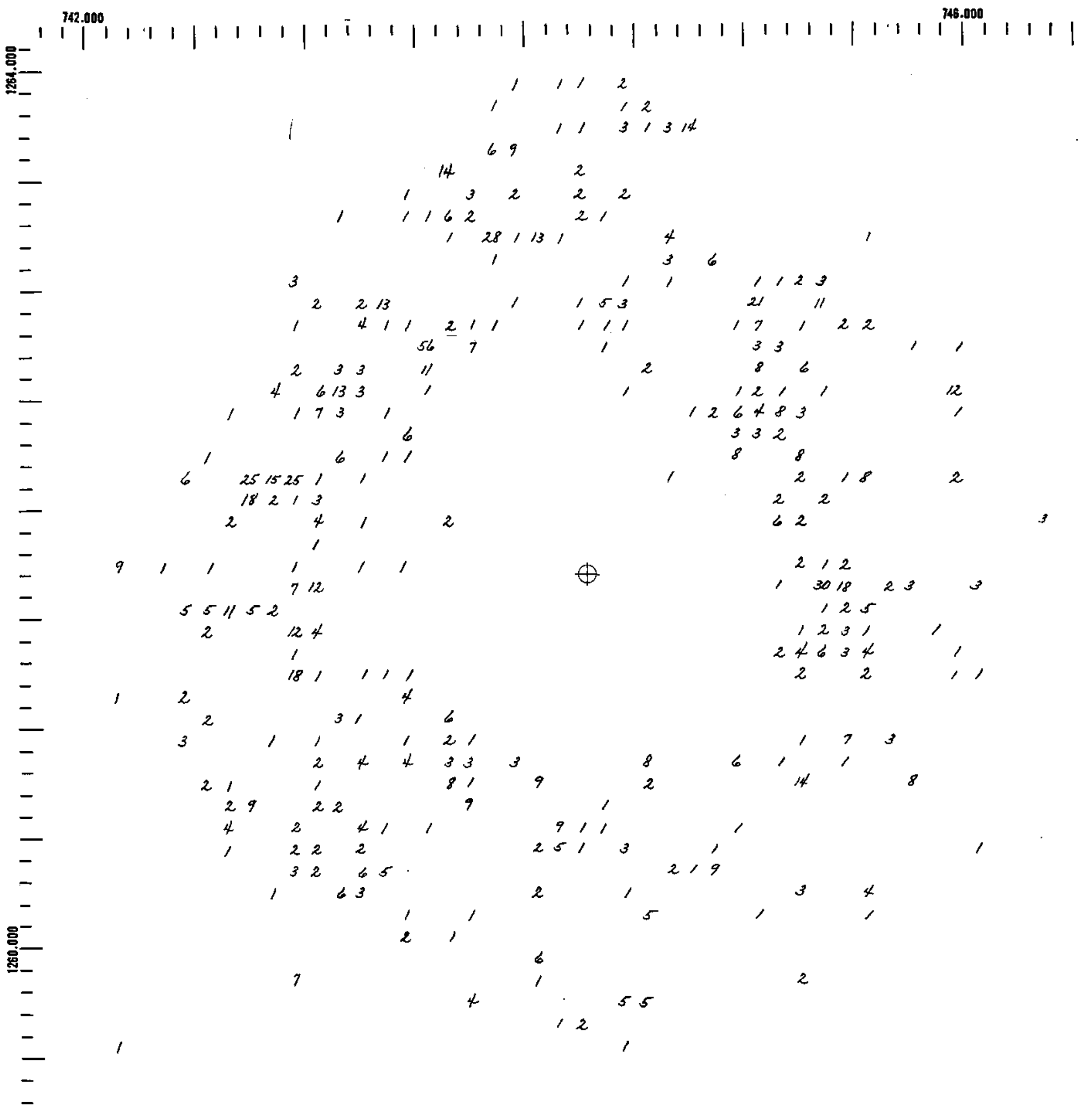


FIG. 11

GEOGRAPHICAL DISTRIBUTION OF DATA FOR HIROSHIMA WOOD-FRAME DWELLINGS

FIG. 12

GEOGRAPHICAL DISTRIBUTION OF DATA FOR HIROSHIMA
OUTSIDE UNSHIELDED

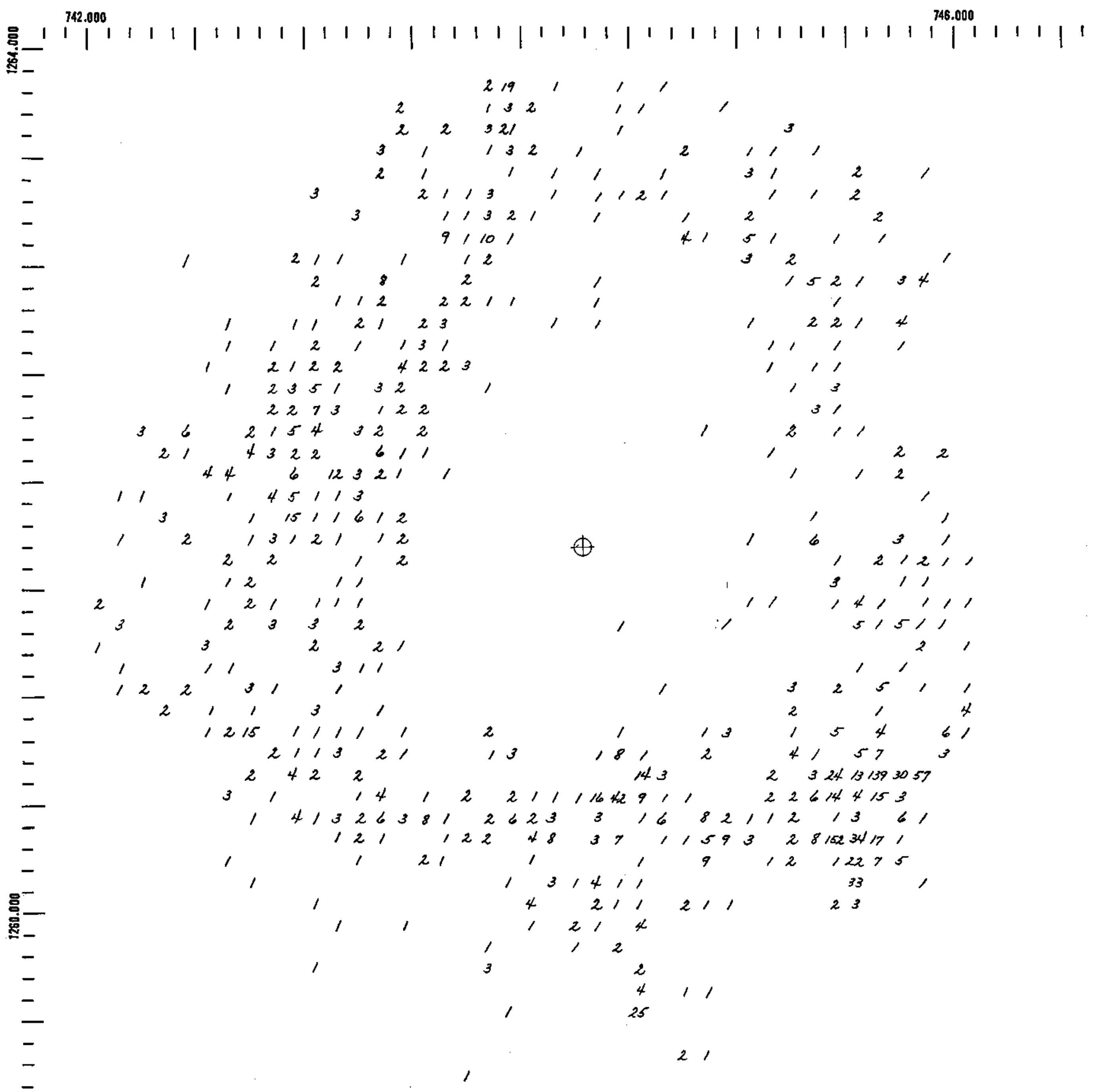


FIG. 13

GEOGRAPHICAL DISTRIBUTION OF DATA FOR NAGASAKI
MISCELLANEOUS UNDERGROUND SHELTERS

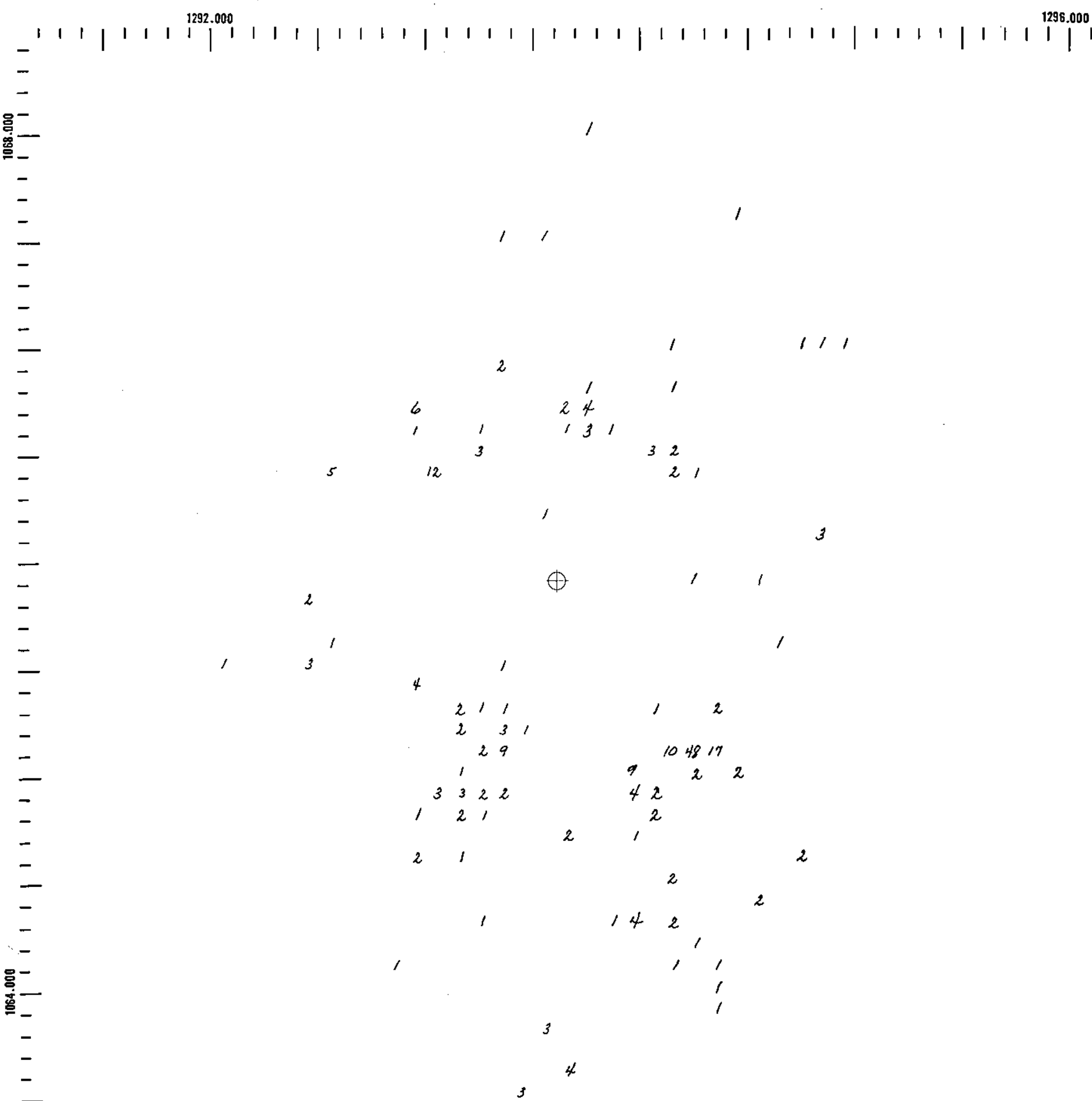


FIG. 14

GEOGRAPHICAL DISTRIBUTION OF DATA FOR NAGASAKI
SEISMIC REINFORCED-CONCRETE BUILDINGS

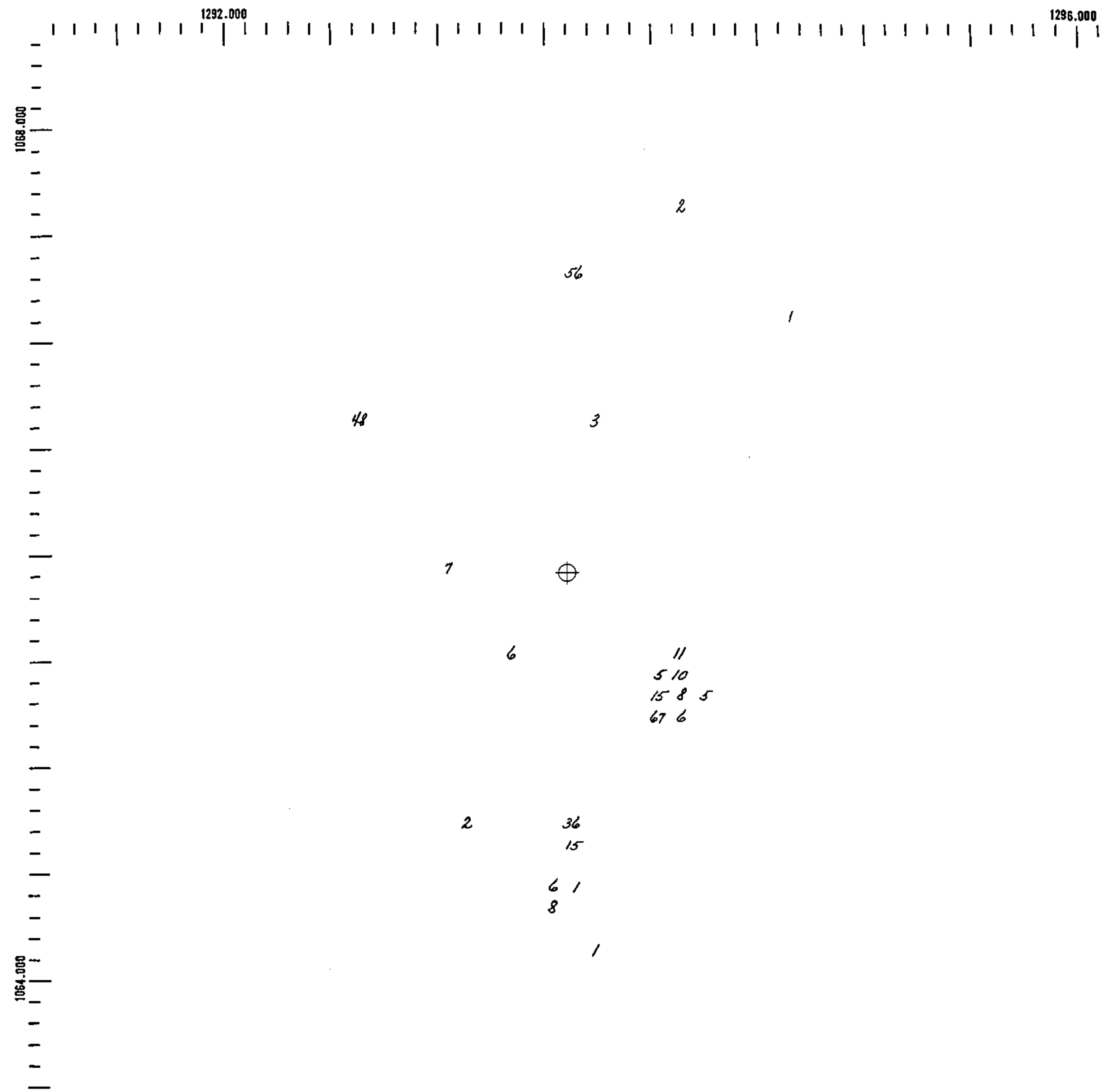


FIG. 15

GEOGRAPHICAL DISTRIBUTION OF DATA FOR NAGASAKI NONSEISMIC REINFORCED-CONCRETE BUILDINGS

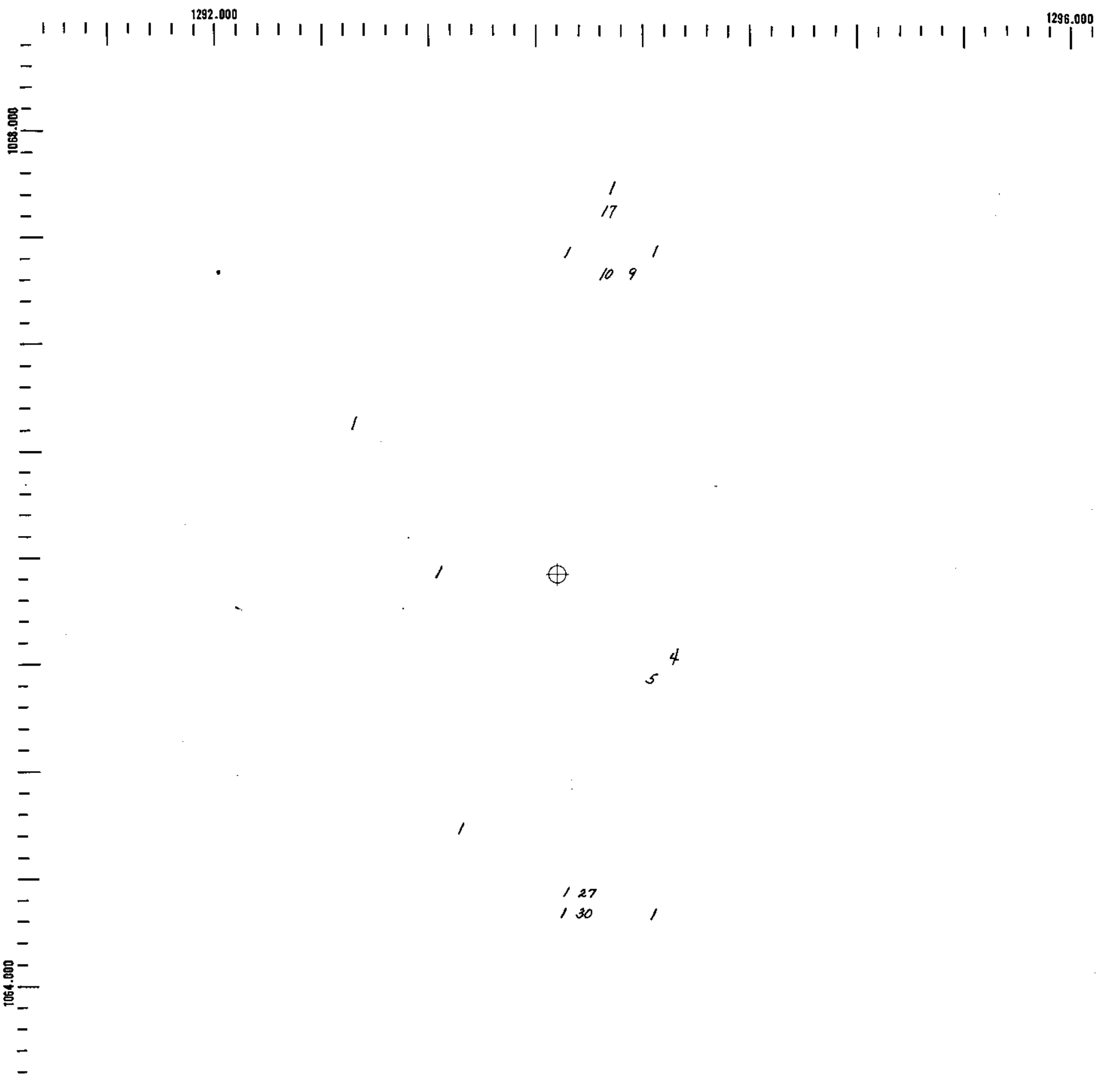


FIG. 16

GEOGRAPHICAL DISTRIBUTION OF DATA FOR NAGASAKI
LIGHT STEEL-FRAME INDUSTRIAL BUILDINGS

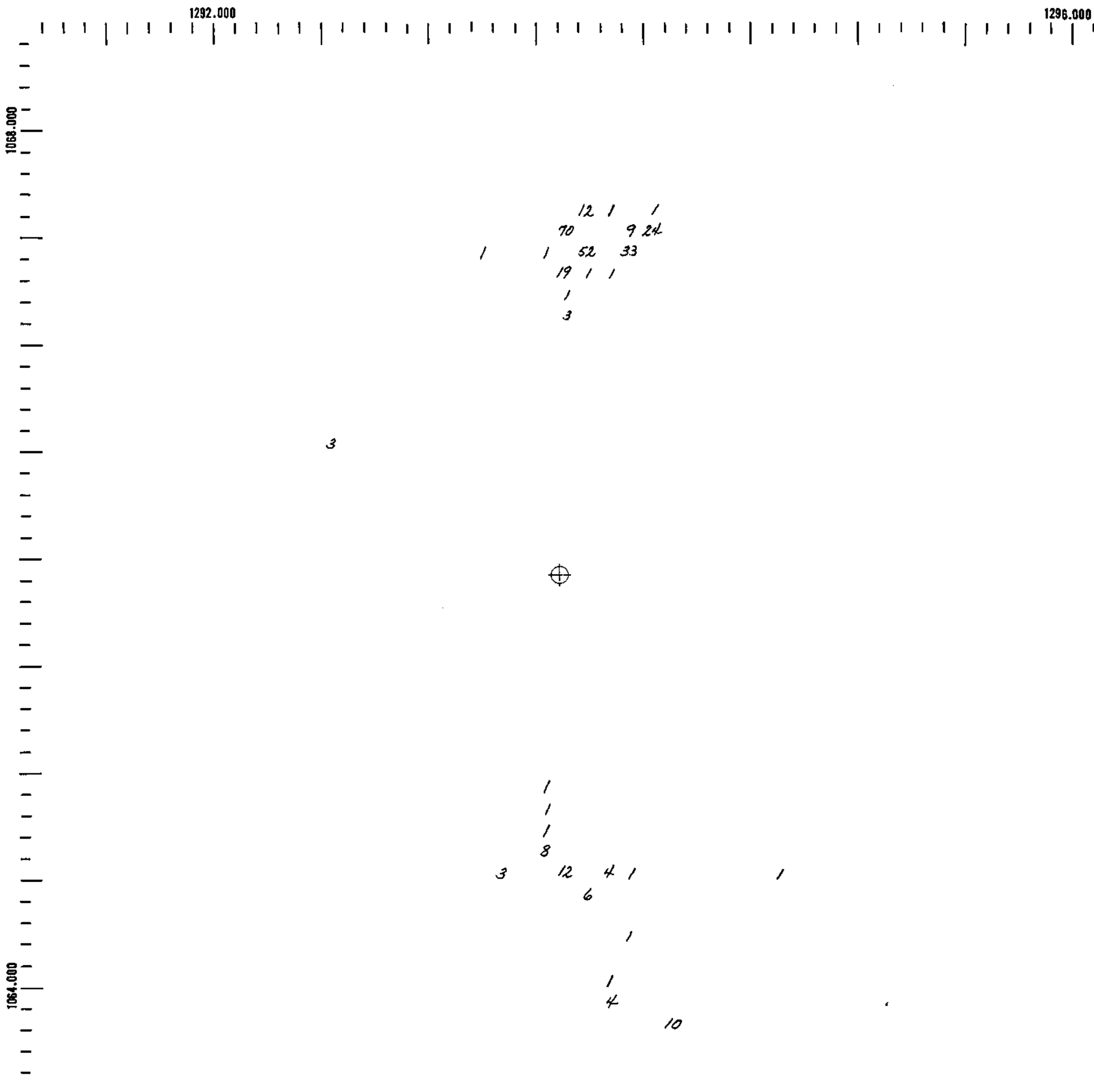


FIG. 17

GEOGRAPHICAL DISTRIBUTION OF DATA FOR NAGASAKI
OUTSIDE SHIELDED BY LIGHT BUILDINGS

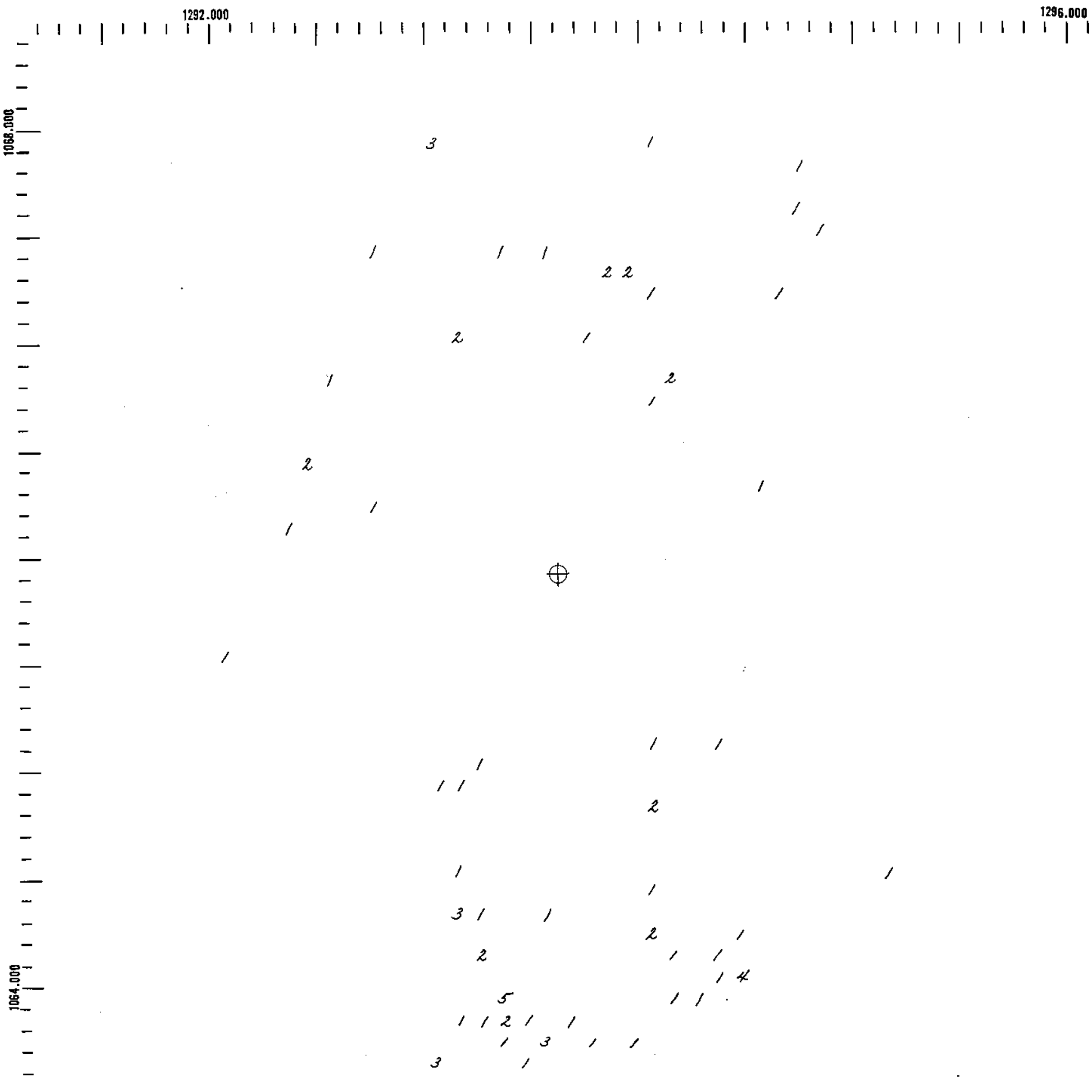


FIG. 18

GEOGRAPHICAL DISTRIBUTION OF DATA FOR NAGASAKI
WOOD-FRAME COMMERCIAL BUILDINGS

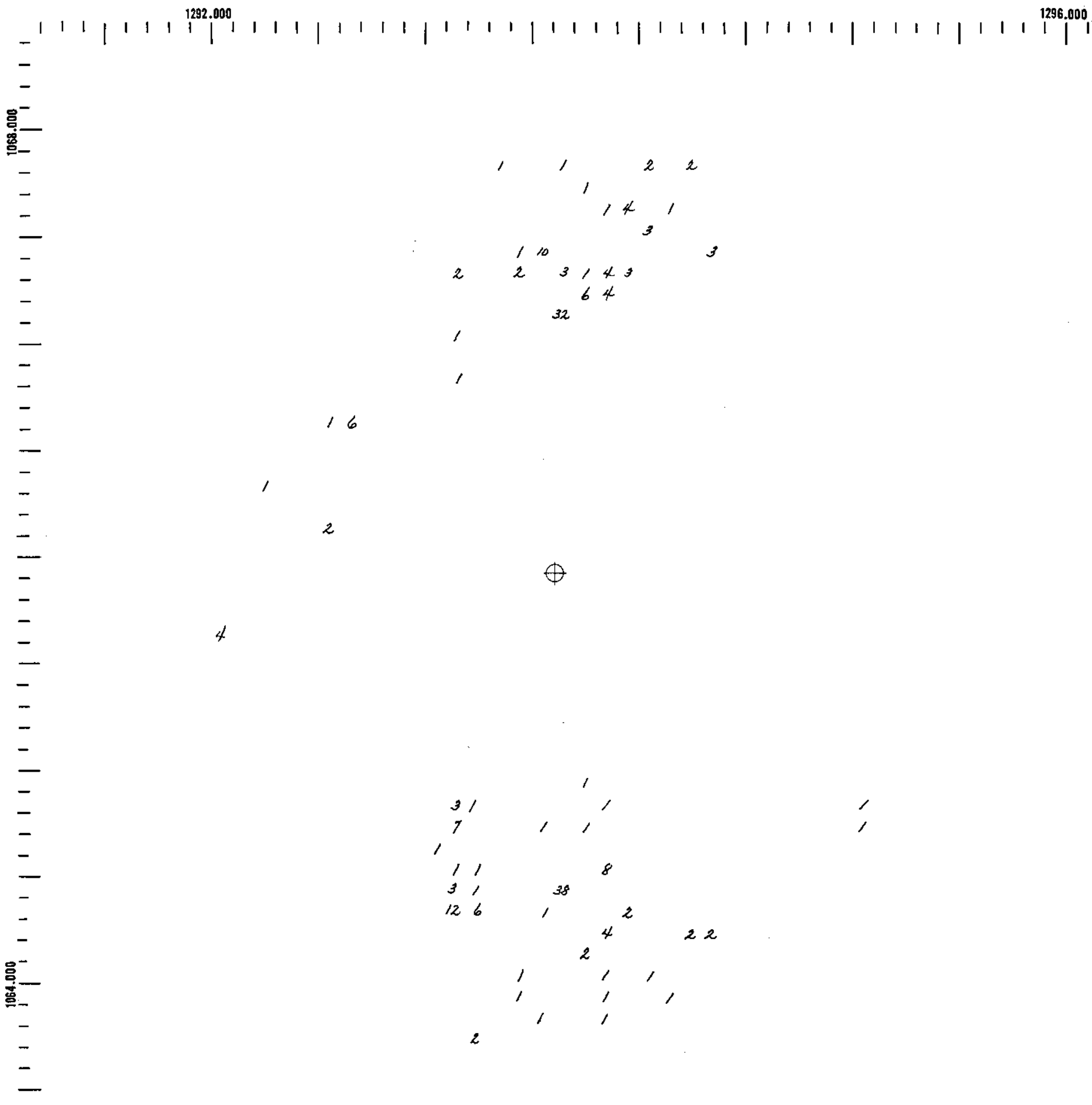


FIG. 19

GEOGRAPHICAL DISTRIBUTION OF DATA FOR NAGASAKI WOOD-FRAME DWELLINGS

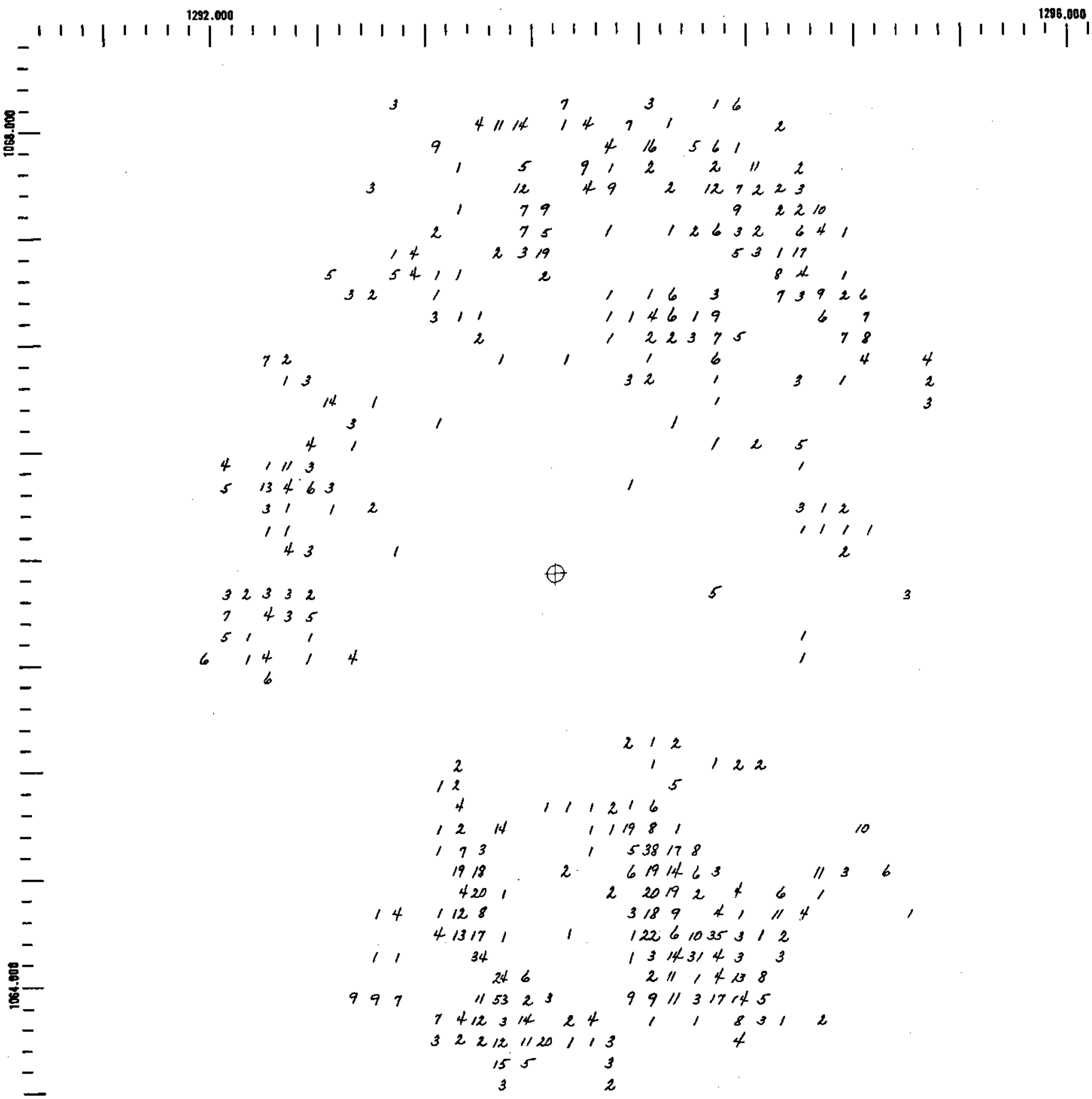


FIG. 20

GEOGRAPHICAL DISTRIBUTION OF DATA FOR NAGASAKI
OUTSIDE UNSHIELDED

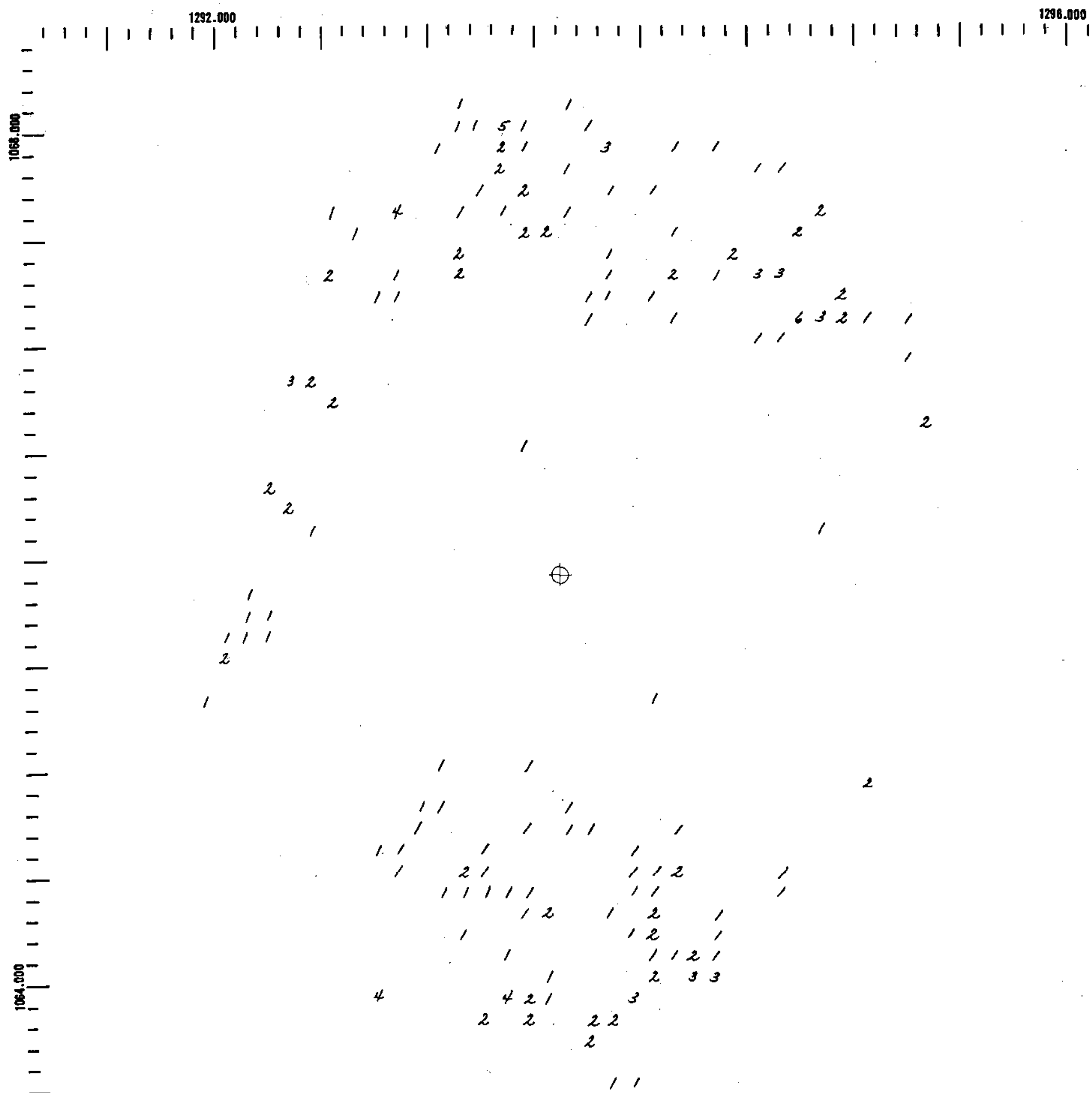


FIG. 21

DISTRIBUTION OF MODERATE BLAST INJURIES FOR HIROSHIMA WOOD-FRAME DWELLINGS

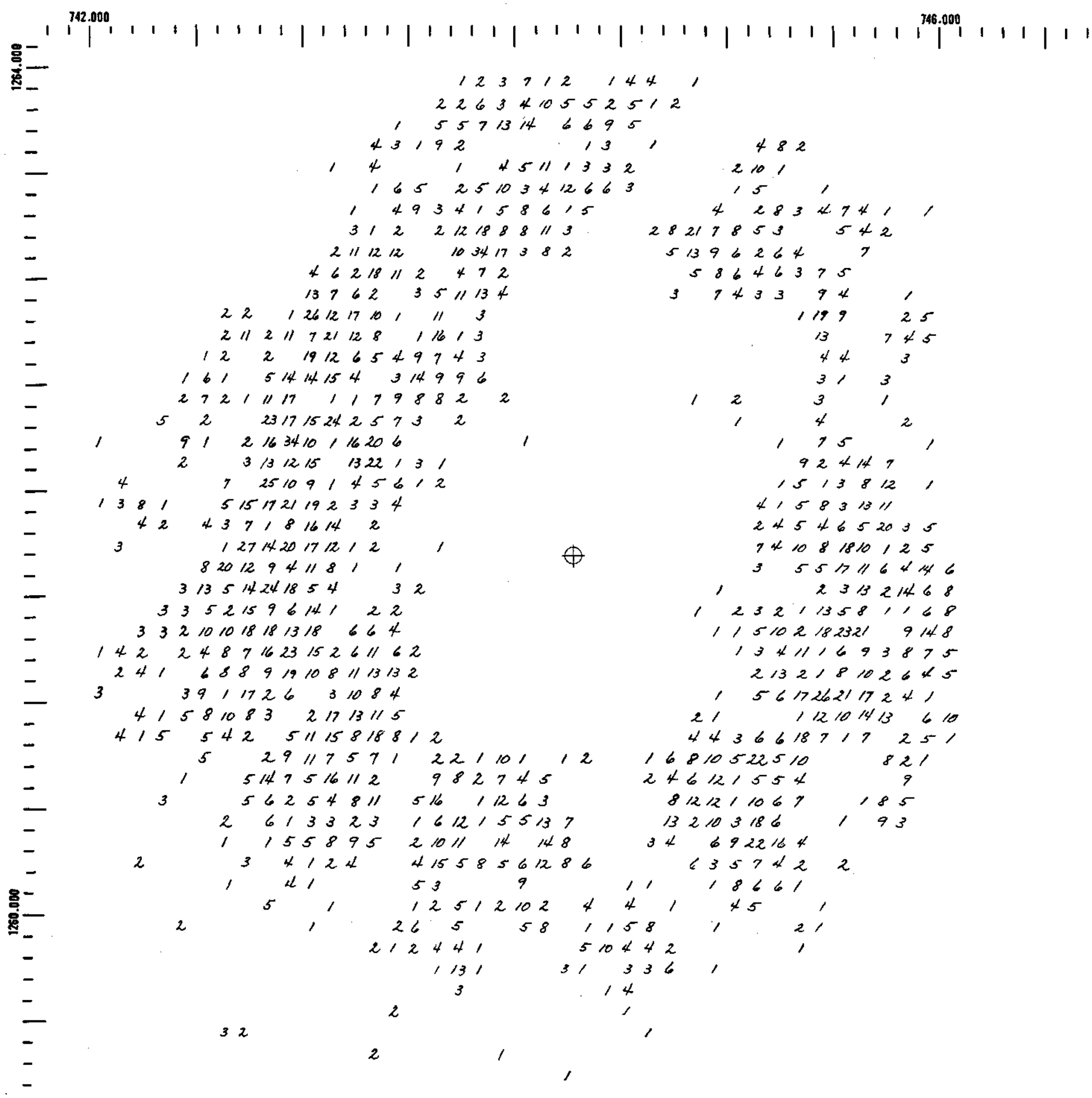


FIG. 22

DISTRIBUTION OF SEVERE BLAST INJURIES FOR HIROSHIMA WOOD-FRAME DWELLINGS

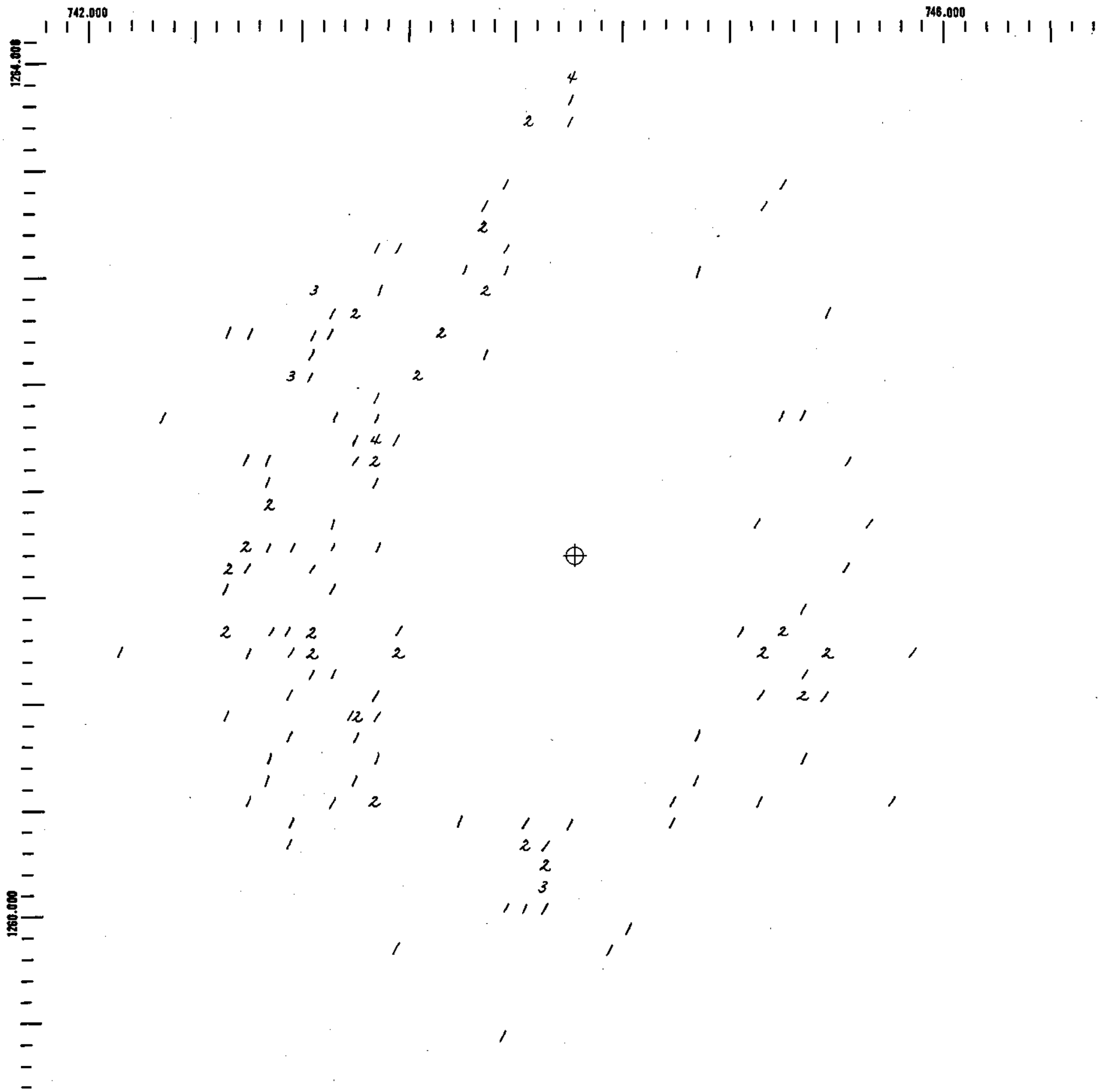


FIG. 23

DISTRIBUTION OF MODERATE FLASH BURNS FOR HIROSHIMA
OUTSIDE UNSHIELDED

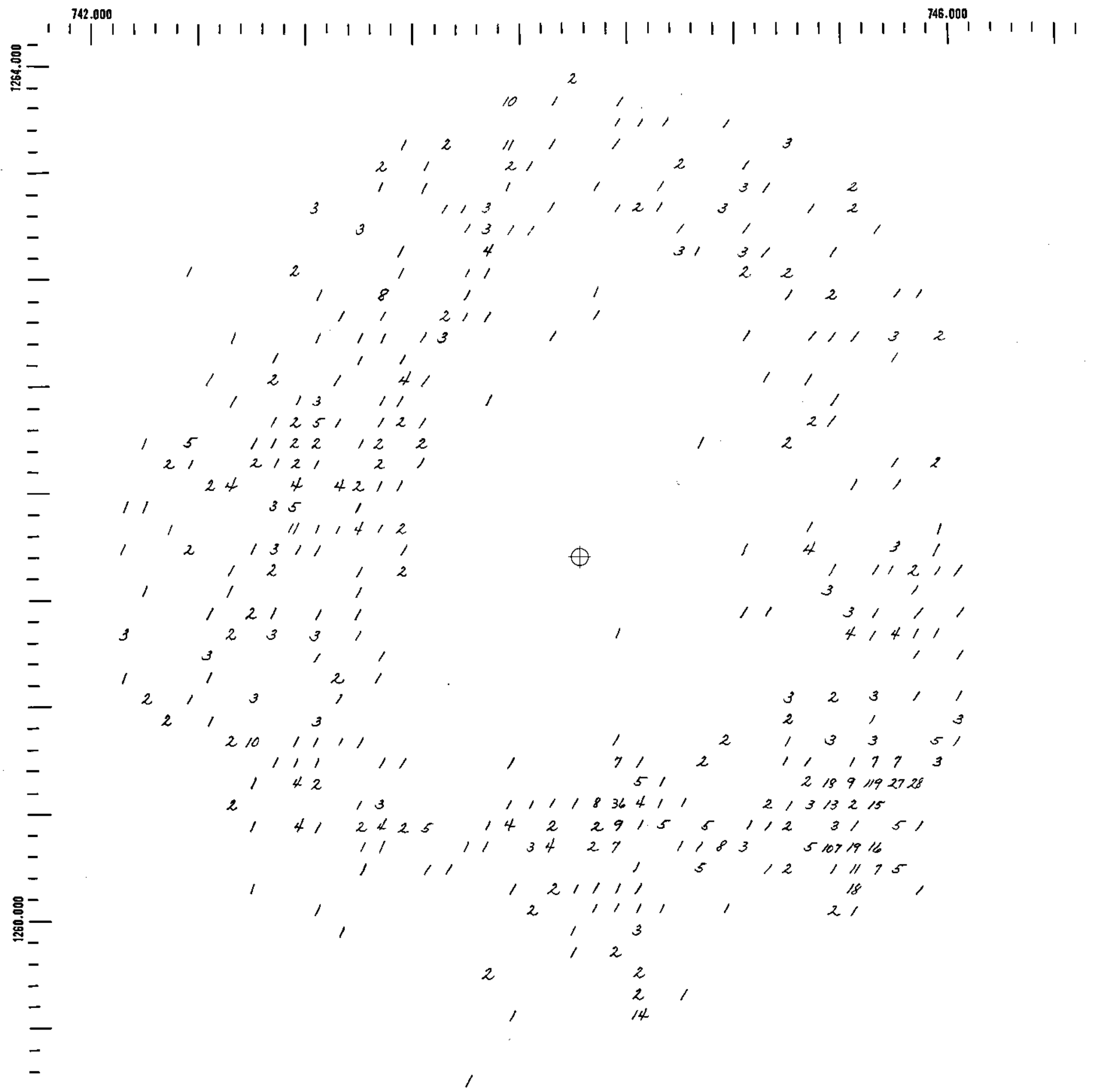


FIG. 24

DISTRIBUTION OF SEVERE FLASH BURNS FOR HIROSHIMA
OUTSIDE UNSHIELDED

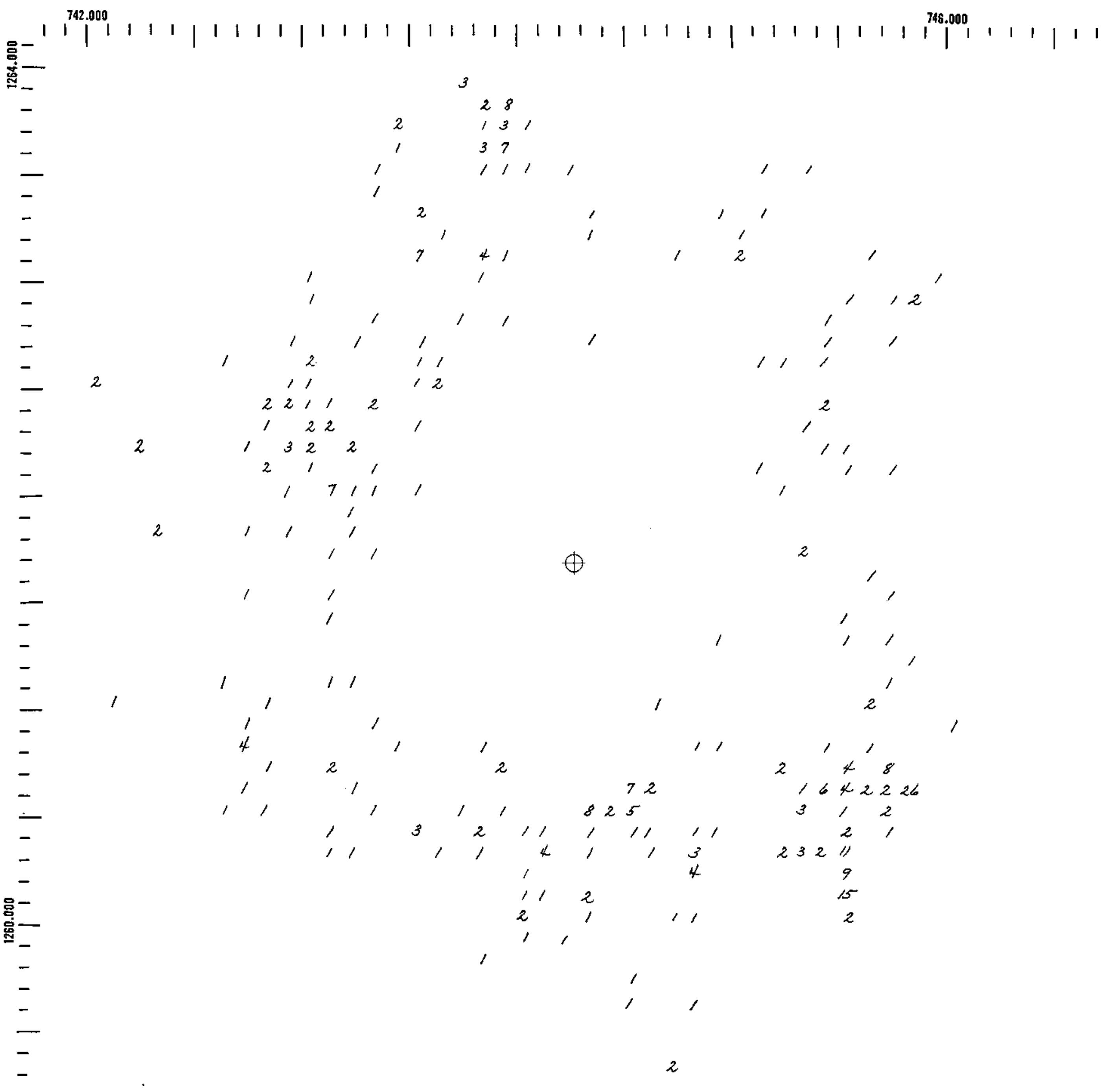


FIG. 25

DISTRIBUTION OF MODERATE BLAST INJURIES FOR NAGASAKI WOOD-FRAME DWELLINGS

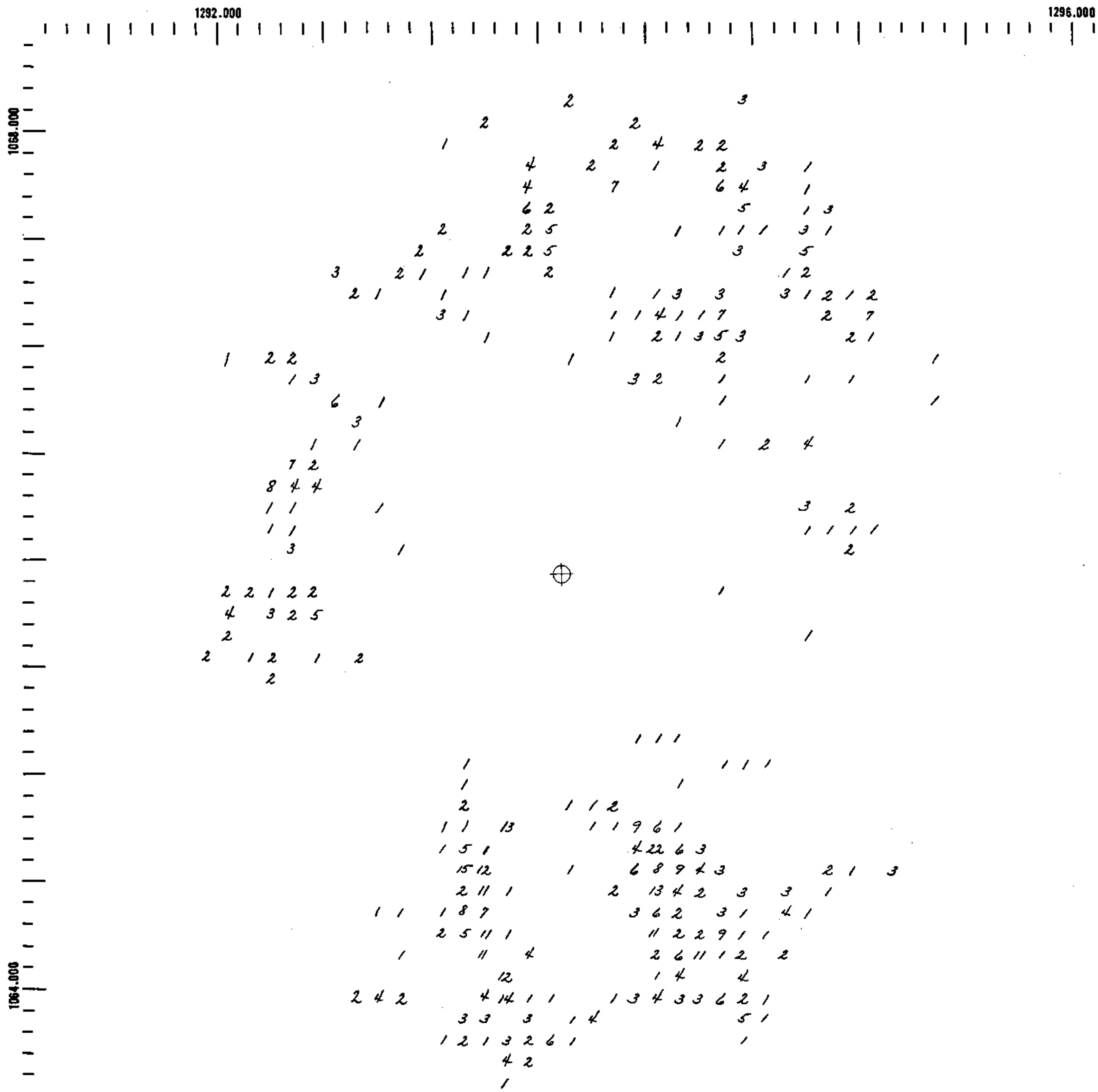
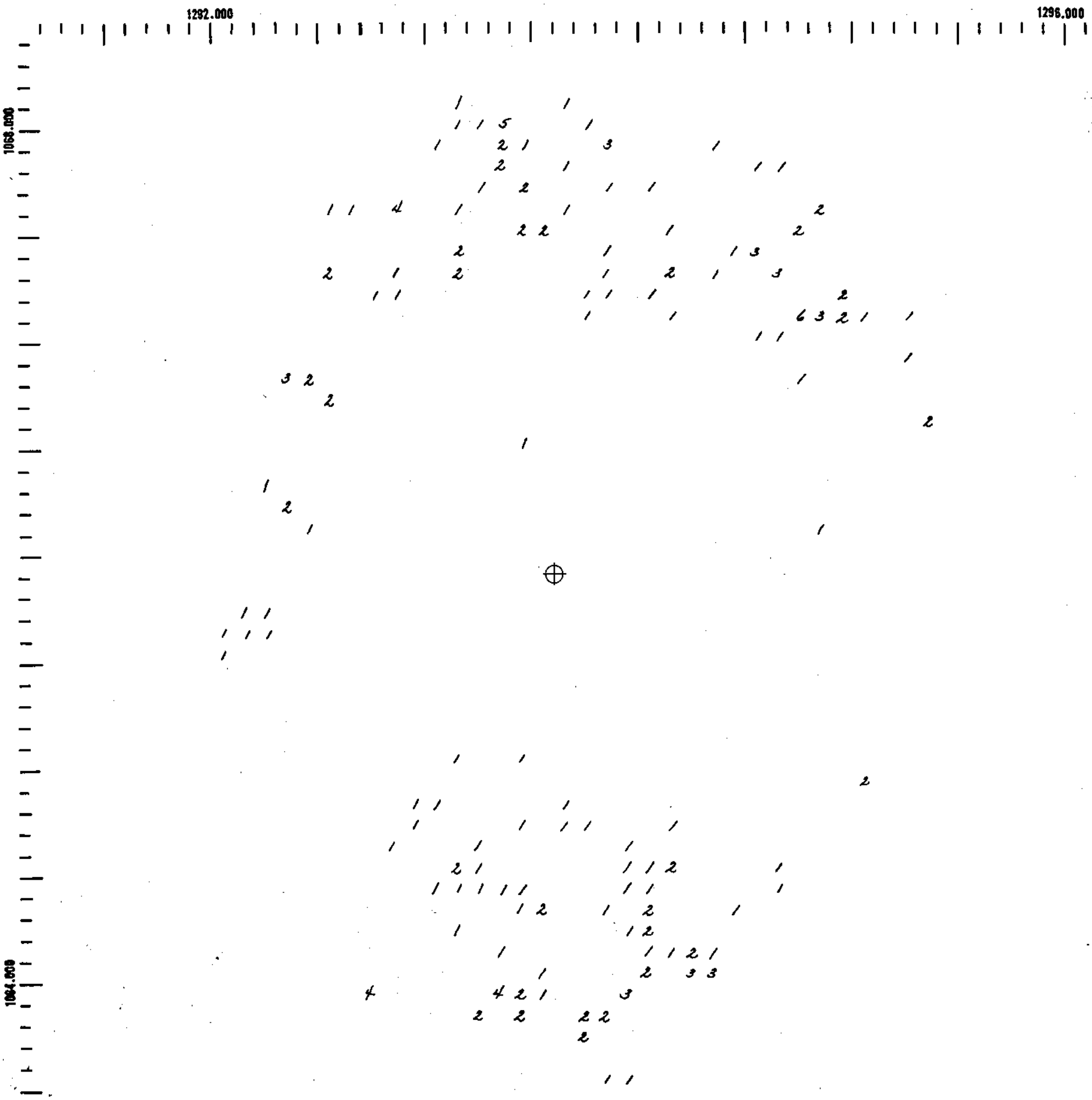


FIG. 26

DISTRIBUTION OF MODERATE FLASH BURNS FOR NAGASAKI
OUTSIDE UNSHIELDED



CHAPTER IV

SUMMARY OF CASUALTY DATA FOR SPECIFIC BUILDINGS

The reasons for a person's survival depend largely on the weapons effects and missile environment in his immediate area and on his susceptibility to injury. For individuals in buildings the weapons effects environment is altered by many factors, such as the amount and type of shielding, subject's location with respect to exterior building openings, etc.

The purpose of this section is not to attempt to explain the reason for an individual's survival, but rather to list the amount and type of data available for further study. Only data on public buildings is included. The large amount of data available on private residences, the construction similarity, and the meager number of people associated with any particular residence limit the usefulness of such information in a report on casualty data for specific buildings. These data are available on magnetic tape for such future use as may be required.

The prime source for a listing of public buildings came from the United States Strategic Bombing Survey reports (Refs. 1 and 2) for Hiroshima and Nagasaki. In these reports 171 buildings in Hiroshima and 267 in Nagasaki were discussed in detail. All 438 of these buildings were subject to detailed examination during the course of this study. Other buildings, not found in these reports, were added to the list of those investigated if enough data were available.

The information summarizing the data gathered for specific buildings in both Hiroshima and Nagasaki is contained in the tables presented in Appendices B, C, D, and E. Appendix B is concerned with construction details and related data for specific public buildings in Hiroshima, and Appendix C gives corresponding data for specific public buildings in Nagasaki. Information is included in these tables on the distance of each building from the hypocenter, general building construction, number of floors above and below ground, building use, and percent and cause of structural damage. The general building construction is further broken down into specific construction details, such as roof, floor, and exterior wall construction and trim; interior wall and ceiling construction and finish; and other data of interest. Information is also included on the availability of building plans and their details. The information on building construction was gathered from three sources: descriptions included in the case histories, descriptions included in the early source data, and descriptions from the United States Strategic Bombing Survey reports. Building plans and layouts were also obtained from the above sources.

Appendices D and E are concerned with the actual casualty data available for the specific public buildings discussed in Appendices B and C. Some of the material is also presented in the Joint Commission reports (Ref. 3). These tables give the number of people associated with each floor of a building together with information on their survival.

In Hiroshima a total of 1523 case histories have been located for people who were in these specific public buildings at the time of the bombing. Of the 1523 known to have been in these buildings, 1122 can be positioned. Of the total number of people located in these buildings, 183 died of which 124 can be placed; 1012 were injured of which 760 can be placed; and 205 were uninjured of which 124 can be placed. The remaining 123 (of which 114 can be placed) were reported missing, and their fate is unknown. A breakdown of the number of people located and positioned by floor for Hiroshima is given in Table 1.

In Nagasaki a total of 1425 case histories for people in specific public buildings have been located. A total of 1286 can be positioned of the 1425 known to have been in one of these buildings at the time of the bombing. Two hundred thirty-three of those located died, and of these 231 were positioned. In addition, 917 of those located were injured of which 801 can be placed, and 124 were uninjured of which 106 can be placed. The fate of the remaining 151 (of which 148 can be placed) is unknown as they were reported missing. The breakdown of those located and positioned by floor in Nagasaki is given in Table 2.

Several of the public buildings in both Hiroshima and Nagasaki are worthy of further study. A list of these specific buildings is given in Table 3. Buildings were placed on the list if sufficient construction information is known (in order to develop detailed floor plans) and if sufficient case histories (with placement data) are available to make the additional effort desirable.

TABLE 1

DISTRIBUTION OF CASE HISTORIES
FOR SPECIFIC BUILDINGS IN HIROSHIMA

Floor	Located by Floor	Positioned on Floor
Basement	91	77
First Floor	583	442
Second Floor	304	224
Third Floor	312	241
Fourth Floor	102	79
Fifth Floor	6	6
Sixth Floor	6	5
Seventh Floor	39	28
Unknown as to Floor	80	0
	1523	1122

TABLE 2

DISTRIBUTION OF CASE HISTORIES
FOR SPECIFIC BUILDINGS IN NAGASAKI

Floor	Located by Floor	Positioned on Floor
Basement	33	33
First Floor	914	812
Second Floor	329	302
Third Floor	144	136
Fourth Floor	3	3
Unknown as to Floor	2	0
	1425	1286

TABLE 3

PUBLIC BUILDINGS WORTHY OF FURTHER STUDY

Hiroshima

1. Underground Communications Center
2. Bank of Japan
3. City Hall
4. Radio Station JOFK
5. Department of Communications
6. Chugoku Electric Company
7. Postal Savings Bureau
8. Fukuya Department Store
9. Telephone Company

Nagasaki

1. Shiroyama School
2. Chinzei School
3. Fuchi School
4. University Hospital Complex
5. Mitsubishi Torpedo Works (Office and Laboratory)

CHAPTER V

CALCULATION OF WEAPON YIELDS BASED ON THERMAL INJURIES

One outcome of this study was an estimate of the yields of both nuclear weapons dropped on Japan based on the distance to which stated severity of burns occurred to people who were outside and unshielded. Only those who were associated with groups of two or more people were utilized from the total data base in an attempt to obtain the most realistic percentages. By employing these criteria 18, 506 case histories were available for Hiroshima of which 2, 423 persons were outside and unshielded (exposed to direct thermal radiation). For Nagasaki 6, 629 case histories were available, and of these 552 were outside and unshielded.

Of the 2, 423 persons exposed to direct thermal radiation in Hiroshima, 966 received flash burns of either second or third degree. A total of 475 received second-degree burns, and 491 received third-degree burns. Plots of the percentage of the people in the outside-unshielded category for Hiroshima receiving second- and third-degree burns versus horizontal range are given in Fig. 27.

The equation for calculating the number of calories per square centimeter at a given range for airburst nuclear weapons can be expressed as follows (from Ref. 4):

$$Q = \frac{0.38 \times 10^{12}\, W\, \overline{T}}{4 \pi r^2} \qquad (1)$$

where,

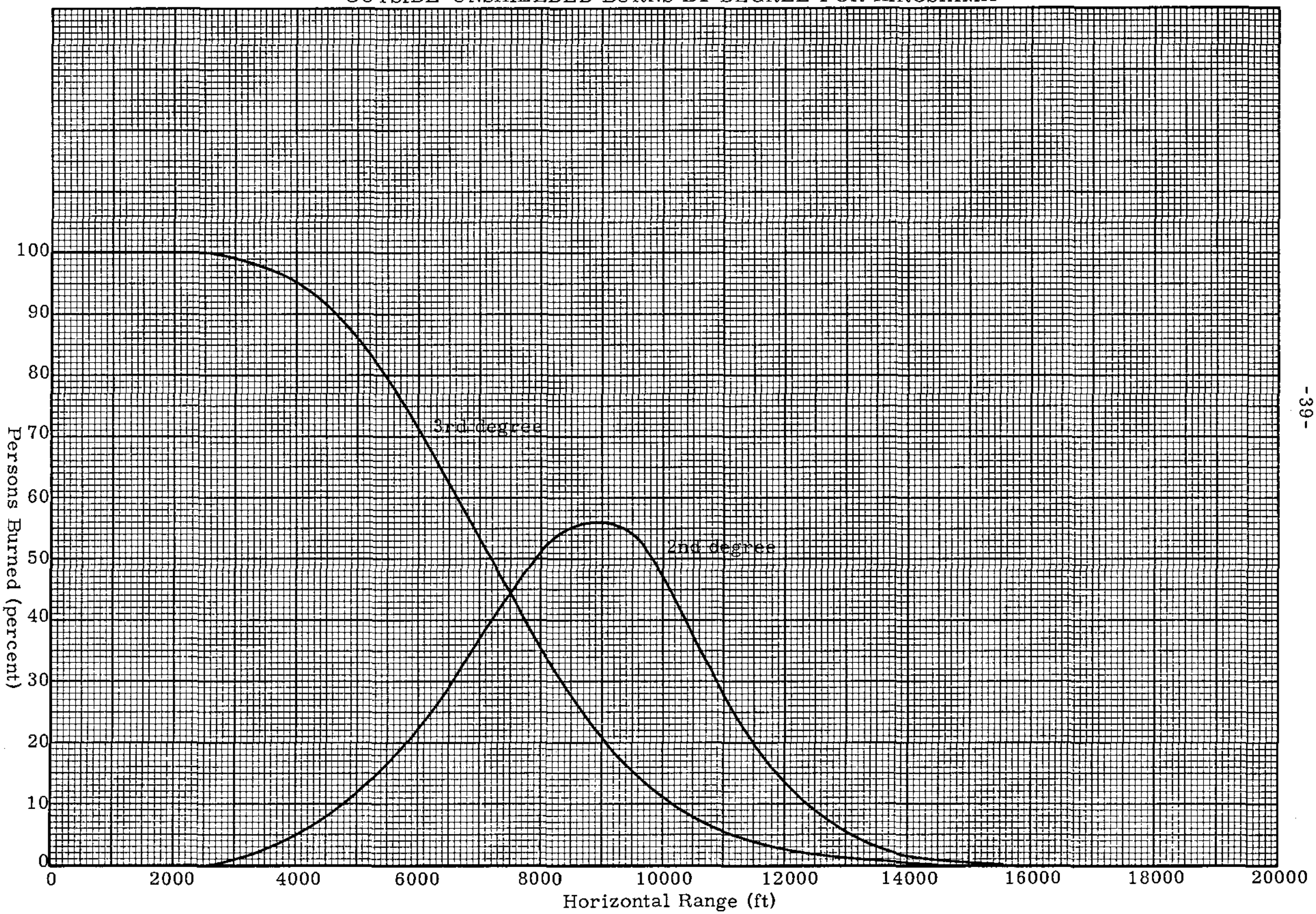
- Q = radiant exposure in calories per square centimeter,
- W = nuclear yield in kilotons,
- $\overline{T}$ = average atmospheric thermal transmissivity (from Ref. 5), and
- r = slant range in centimeters.

Solving for yield, one obtains

$$W = \frac{4 \pi r^2 Q}{0.38 \times 10^{12}\, \overline{T}} \qquad (2)$$

FIG. 27

OUTSIDE-UNSHIELDED BURNS BY DEGREE FOR HIROSHIMA



To compute slant ranges, the height of burst for each city must be known. The latest accepted values for these burst heights are as follows:

Hiroshima -- 570 meters or 1870 feet
Nagasaki -- 500 meters or 1640 feet.

From the thermal injury curves in Fig. 27 the horizontal range for which 50 percent of the people in Hiroshima received second-degree burns occurred at 9850 feet, and the horizontal range for which 50 percent of the people received third-degree burns occurred at 7190 feet. The slant range for second-degree burns occurred at 3060 meters, and the slant range for third-degree burns occurred at 2260 meters.

The average atmospheric transmissivity $\overline{T}$ for the above slant ranges, using a visibility of 10 miles, was 0.681 and 0.719, respectively, for the second- and third-degree-burn data. (The sky was clear over Hiroshima.)

The only variable not yet defined is the value of Q for producing second- and third-degree burns. A radiant-exposure level for bare, light-colored skin (Ref. 6) of 4.4 cal/cm^2 will give second-degree burns to 50 percent of those exposed from a 12.5-kt yield; 4.6 cal/cm^2 is required from 22 kt. An exposure of 6.7 cal/cm^2 will give third-degree burns to 50 percent of those exposed from a 12.5-kt yield; 7.0 cal/cm^2 is required from 22 kt. (Note that the exposure required is almost independent of yield in this range.)

Based on a study made involving white and negro volunteers (Ref. 7), it was concluded that Japanese skin should burn easier. In this study of thermal energies (applied over a 540-msec period) that were required for various degrees of burns of the skin, it was shown that the white volunteers received second-degree burns from 3.9 cal/cm^2, whereas negro volunteers required from 1.8 to 2.9 cal/cm^2. The difference was also noted for third-degree burns, where 4.8 cal/cm^2 were required for white subjects, and 3.3 to 3.7 cal/cm^2 were required for negro subjects. The low end of the energy range refers to dark-skinned negroes, and the high end refers to light-skinned negroes.

If the amount of thermal exposure necessary to produce second- and third-degree burns on Japanese skin is one-third of the way between dark-skinned negro and white subjects, exposures of 2.8 and 5.3 cal/cm^2 would be required for second- and third-degree burns, respectively, when computed for a pulse typical of the nuclear weapon in Hiroshima. Substituting these values into Eq. (2), yields of <u>12.7 kt</u> and <u>12.5 kt</u> were obtained from the second- and third-degree burn data, respectively, in Hiroshima.

In Nagasaki a total of 266 persons received either second- or third-degree burns out of the 552 persons who were exposed. Two hundred two had burns of second degree while 64 had burns of third degree. Plots of the percentage of the people in the outside-unshielded category for Nagasaki receiving second- and third-degree burns versus horizontal range are given in Fig. 28.

From these curves the horizontal range for which 50 percent of the people received second-degree burns occurred at 9,550 feet; the estimated horizontal range for which 50 percent of the people received third-degree burns occurred at 6,240 feet. The slant range for which 50 percent of the people received second-degree burns occurred at 2,950 meters. The slant range for third-degree burns was not calculated because of the small sample. The average atmospheric transmissivity $\overline{T}$ for the above slant range, using a visibility of 10 miles, was 0.686 for the second-degree-burn case.

Calculating the values of Q for Japanese skin by the method described earlier gives exposures of 3.0 and 5.6 cal/cm^2, respectively, for second- and third-degree burns. Solving for the yield using Eq. (2), a value of 12.6 kt was obtained from the second-degree-burn data for Nagasaki.

The calculated yield for Hiroshima agrees very well with the accepted value of 12.5 kt, whereas the Nagasaki yield is much lower than the accepted value of 22 kt. It is difficult to ascertain the exact reasons for this difference. The samples for Hiroshima and the second-degree-burn data for Nagasaki are sufficiently large to provide fairly realistic results. A cause of this discrepancy may lie in the value for the atmospheric transmission. Using the accepted value of 22 kt for the Nagasaki yield and solving for $\overline{T}$ in Eq. (2), a value of 0.392 is obtained from the second-degree-burn data. This value of $\overline{T}$ requires a fairly low visibility, perhaps due to smoke or clouds. It is known that Nagasaki was covered with clouds at the time of the bombing, but it is thought that the burst was below the cloud cover. Of course, other assumptions will produce other values for the yields, but the point is that the Hiroshima yield is compatible with realistic estimates of thermal radiation and the resulting burns, whereas the Nagasaki results do not make sense unless the burst was obscured by smoke or clouds. Thus, only the Hiroshima results can be used with confidence in scaling thermal casualties to higher yields.

In addition to the above data on thermal injuries, a small amount of data was obtained on mortality versus the percent area burned. Although this information was not used in computing the yield, it is closely tied to burn injury. Sufficient data on percent area burned were unavailable for Hiroshima. The plot for Nagasaki of burn mortality versus the percent of skin area burned is given in Fig. 29. The method for determining mortality percentages did not discriminate as to the location burned, only the amount of area burned.

FIG. 28

OUTSIDE-UNSHIELDED BURNS BY DEGREE FOR NAGASAKI

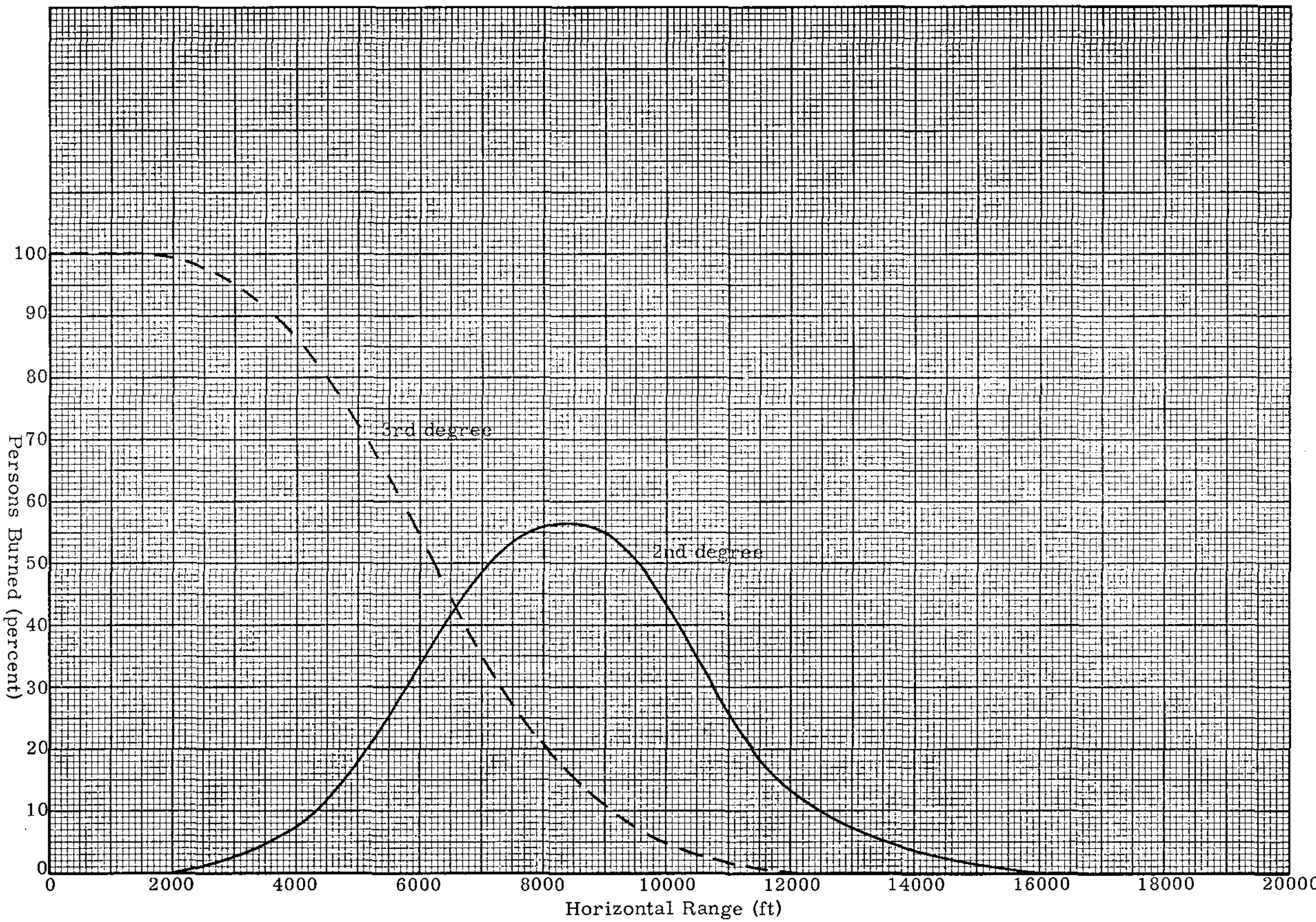
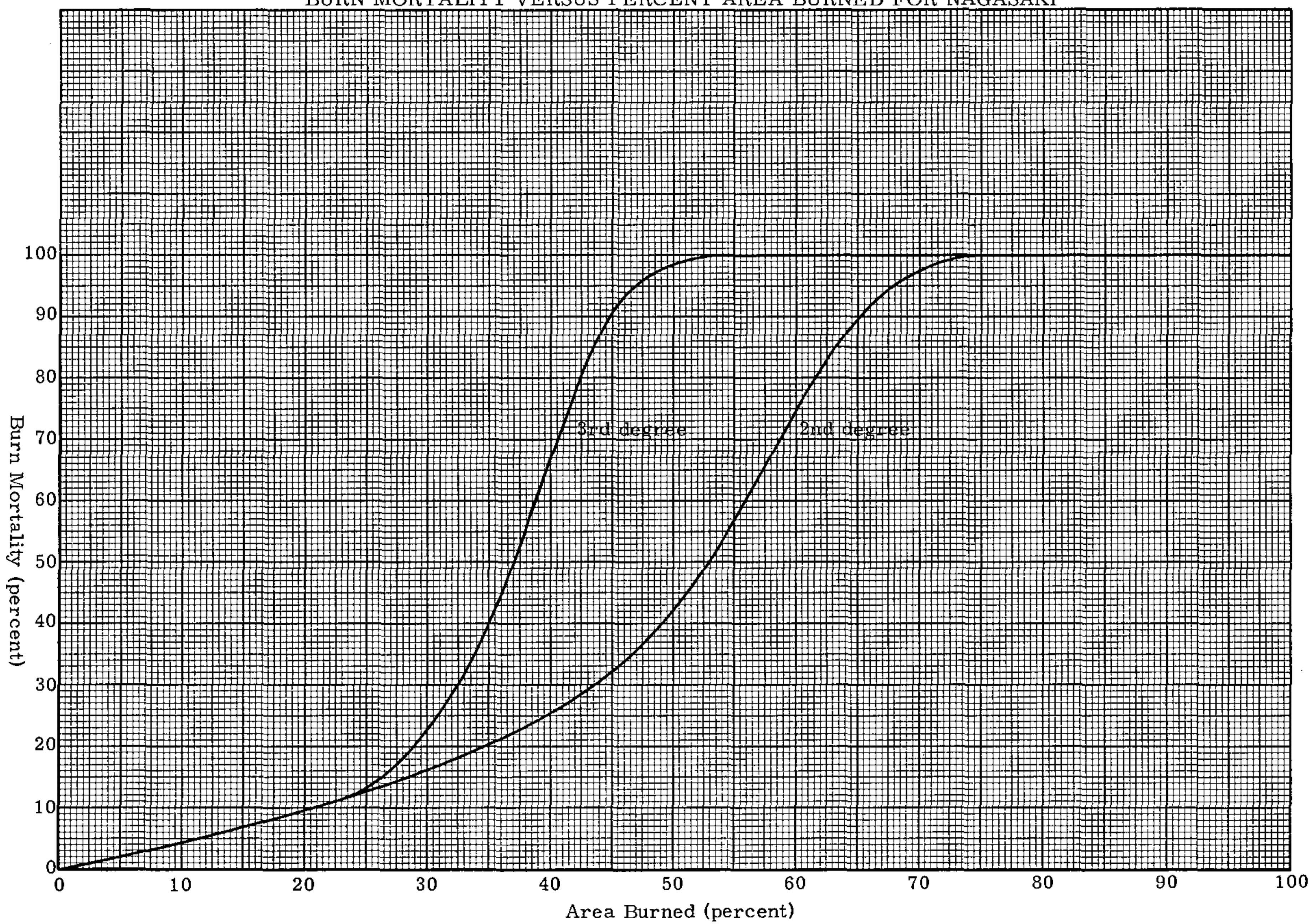


FIG. 29

BURN MORTALITY VERSUS PERCENT AREA BURNED FOR NAGASAKI



CHAPTER VI

FREE-FIELD WEAPONS EFFECTS FOR HIROSHIMA AND NAGASAKI

A. INITIAL NUCLEAR RADIATION

The information on yield, burst height, and initial nuclear radiation was supplied by Mr. John A. Auxier, Health Physics Division, of the Oak Ridge National Laboratory (ORNL) and later published in Ref. 8*. The best estimates available indicate that the Hiroshima yield was 12.5 kt and that the Nagasaki yield was 22 kt. The Nagasaki yield is believed to be more precise than that for Hiroshima. The burst heights were given as 570 meters (1870 feet) for Hiroshima and 500 meters (1640 feet) for Nagasaki.

The initial nuclear radiation was given by a series of equations. The neutron dose for Hiroshima was given as follows:

$$D_n = \frac{9.36 \times 10^{11}}{R^2} e^{-R/650} \tag{3}$$

where,

D_n = neutron dose in rads, and

R = slant range in feet.

The gamma dose D_g in rads for Hiroshima was given as in Eq. (4).

$$D_g = \frac{3.71 \times 10^{11}}{R^2} e^{-R/820} \tag{4}$$

The neutron, gamma, and total initial nuclear dose curves for Hiroshima are given as a function of range in Fig. 30.

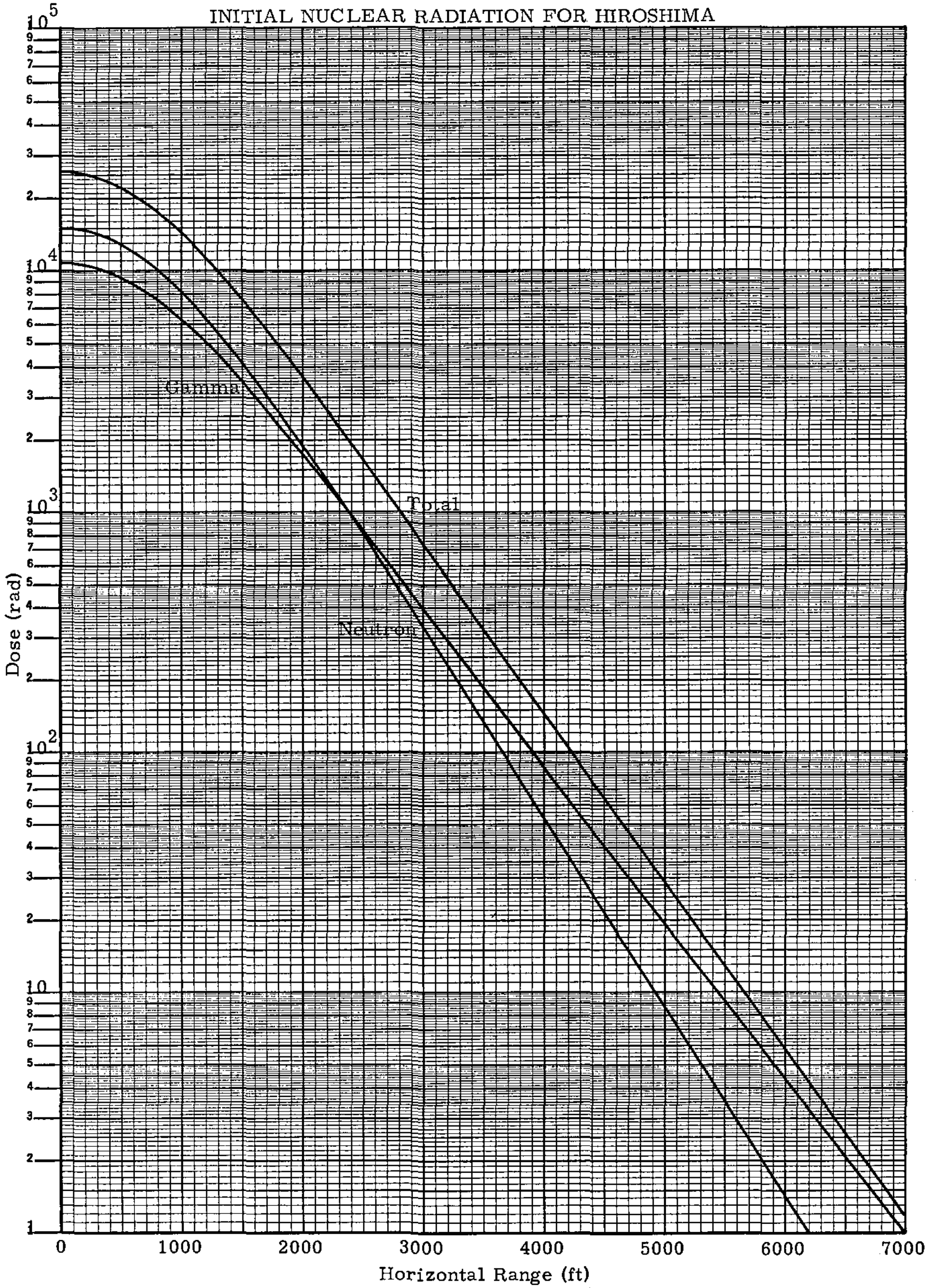
The neutron dose D_n in rads for Nagasaki was given as follows:

$$D_n = \frac{1.399 \times 10^{11}}{R^2} e^{-R/650} \tag{5}$$

*This information was developed for use by the Atomic Bomb Casualty Commission in Japan.

FIG. 30

INITIAL NUCLEAR RADIATION FOR HIROSHIMA



The gamma dose D_g in rads for Nagasaki was given as in Eq. (6).

$$D_g = \frac{2.96 \times 10^{11}}{R^2} e^{-R/1148} \tag{6}$$

The neutron, gamma, and total initial nuclear dose curves for Nagasaki are given as a function of range in Fig. 31.

B. BLAST AND THERMAL RADIATION

Knowing the yields and burst heights of the Japanese devices, as previously described, the overpressures in both Hiroshima and Nagasaki were obtained from the near-ideal pressure-distance-height curves in the 1962 edition of The Effects of Nuclear Weapons (same as in Ref. 9). These values were plotted versus horizontal range in Figs. 32 and 33, respectively. The overpressure curve shown for Hiroshima should be quite good since the city is located on a flat plain. However, no provision was made for the modification of the overpressures due to the hills in Nagasaki because 1) detailed data were not available on the slopes and 2) a large portion of the casualty data were located only by sectors instead of coordinates.

From previous Dikewood work (Ref. 4) the thermal radiation from an airburst can be expressed as follows:

$$Q = \frac{0.38 \times 10^{12} W \overline{T}}{4 \pi r^2} \tag{7}$$

where,

Q = radiant exposure in calories per square centimeter,

W = nuclear yield in kilotons,

$\overline{T}$ = average atmospheric thermal transmissivity (from Ref. 5), and

r = slant range in centimeters.

The visibility was assumed to be 10 miles in both cities. This assumption was found to be quite realistic for Hiroshima as shown by the calculations in Chapter V. However, the results for Nagasaki did not substantiate this assumption. Nevertheless, data from other sources indicate that the visibility below the cloud cover must have approached 10 miles. The thermal radiation as obtained from Eq. (7) was plotted versus horizontal range for both Hiroshima and Nagasaki* in Figs. 32 and 33, respectively.

*The curve for Nagasaki is considered to be much less reliable than the curve for Hiroshima.

FIG. 31
INITIAL NUCLEAR RADIATION FOR NAGASAKI

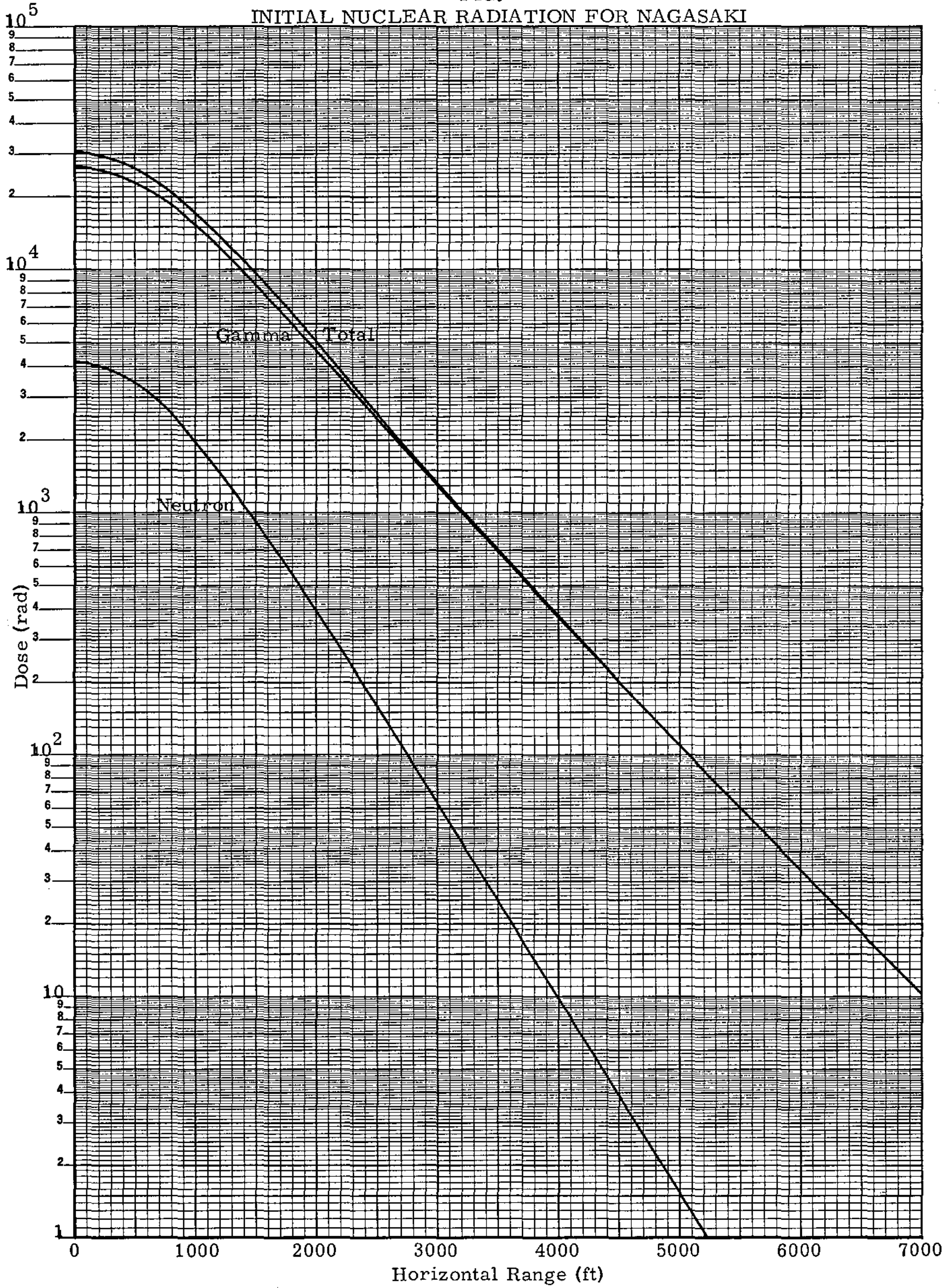


FIG. 32

OVERPRESSURE AND THERMAL RADIATION FOR HIROSHIMA

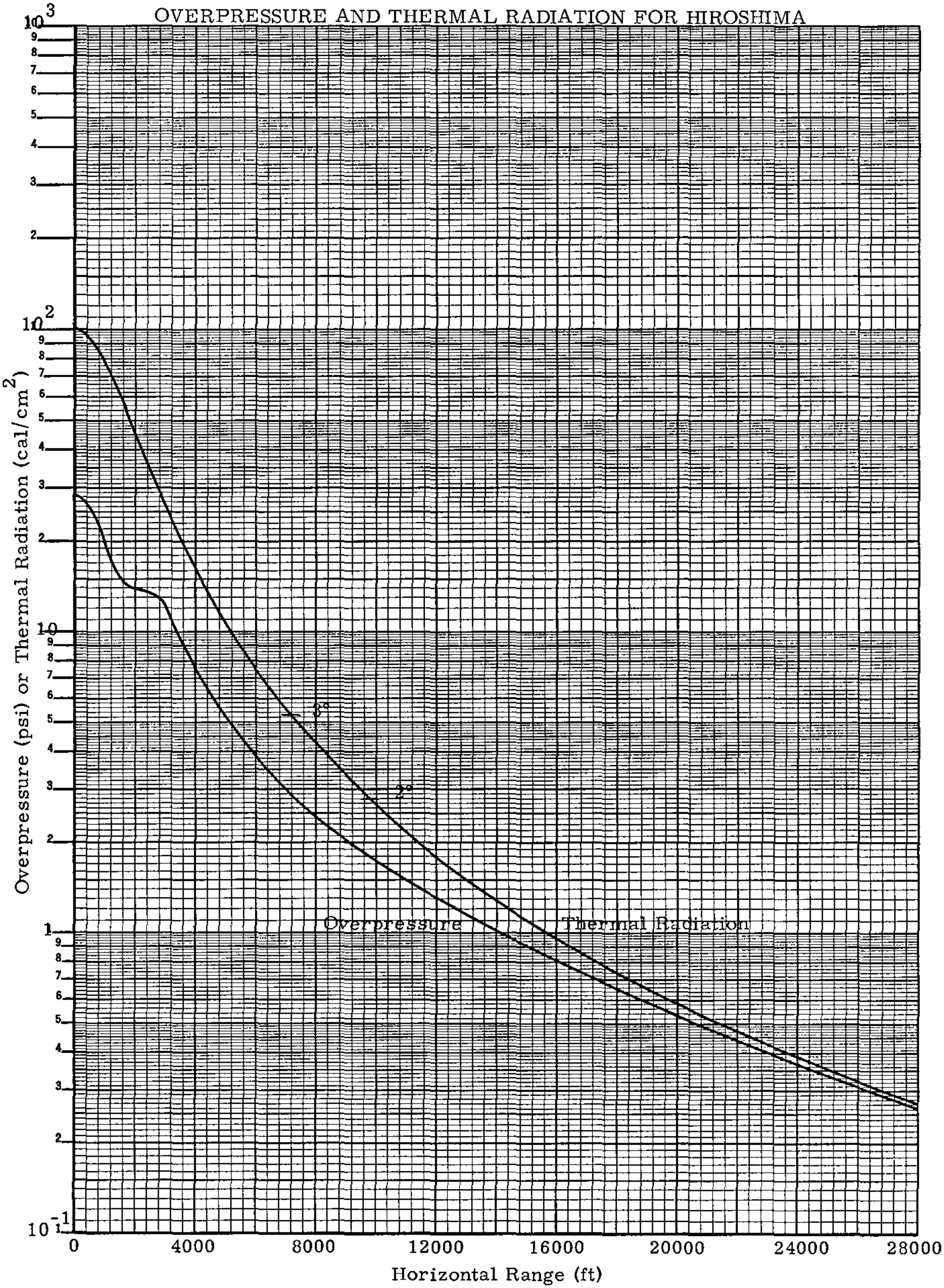
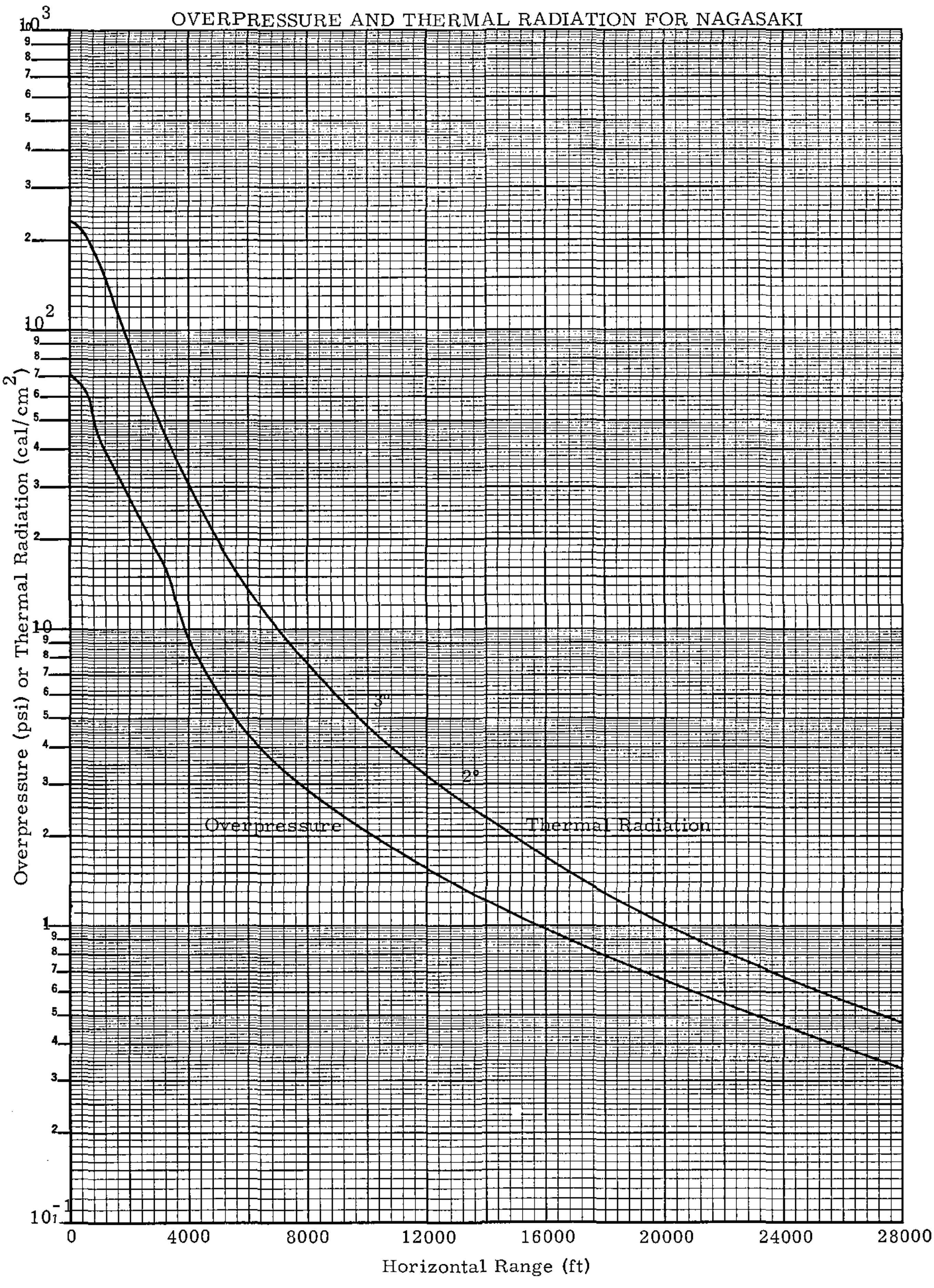


FIG. 33

OVERPRESSURE AND THERMAL RADIATION FOR NAGASAKI



CHAPTER VII

MORTALITY AND INJURY CURVES FOR HIROSHIMA AND NAGASAKI

A. INTRODUCTION

The study of the Japanese data from Hiroshima has resulted in mortality and injury curves for four additional shielding locations besides the basic four that were presented for Japan in DC-FR-1028 (Ref. 10). These additional shielding locations are nonseismic reinforced-concrete buildings (NRC),* light steel-frame industrial buildings (LSF), wood-frame commercial buildings (WFC), and vehicles (V) (mostly street cars). The shielding categories presented for Japan in DC-FR-1028 are seismic reinforced-concrete buildings (SRC), wood-frame dwellings (WFD), outside-shielded by light buildings (OS), and outside-unshielded (OU).

The study of the Nagasaki data has yielded the same shielding locations with the exception of vehicles and the addition of underground shelters (US). The data from both cities have allowed the subdivision of the seismic reinforced-concrete buildings by floor groupings as follows: lower (SRC-L), middle (SRC-M), and upper floors (SRC-U). The Hiroshima data also allowed the further subdivision by basements (SRC-B). The following discussion will compare those curves presently being derived with those found in DC-FR-1028. (Additional casualty curves are presented in DC-FR-1041, Ref. 11.)

B. DATA BASE FOR MORTALITY AND INJURY CURVES#

The data base for the mortality and injury curves was defined as follows. The only persons considered were in groups, defined to be a gathering of two or more persons who were located at the same coordinates and on the same floor of a building. After an individual was determined to be in a group, he was recorded in the proper injury or mortality category according to the horizontal range from the hypocenter, shielding location, and other special subdivisions (such as blast, thermal, and nuclear). This data base contains only those persons on whom there are recorded case histories. Thus, this data base does not contain information about other persons known to a recorded individual unless their case histories have also been recorded.

---

*These abbreviations are used in the figures.

The curves are based on the casualty data from Japan and are independent of the values for yield and burst-height. For estimates of the accuracy of these curves, see Chapter X.

For estimating the relative reliability of the various mortality and injury curves, the following approximate number of case histories recorded for each shielding category are of interest. Of course, the data in each category must be further subdivided by range and casualty mechanism (blast, thermal, and nuclear). In Hiroshima there were approximately 16,000 cases recorded for the shielding locations previously described; the similar number for Nagasaki was about 5500. Therefore, it is not surprising that the curves derived from the Hiroshima data are more reliable. In Hiroshima there were approximately 800 case histories recorded (in groups) in seismic reinforced-concrete buildings, 100 in nonseismic reinforced-concrete buildings, 150 in light steel-frame structures, 1800 in wood-frame commercial buildings, 9300 in wood-frame dwellings, 1300 who were outside but shielded by light buildings, 2400 who were outside and unshielded, and 150 in vehicles. In Nagasaki there were approximately 400 case histories recorded (in groups) in seismic reinforced-concrete buildings, 500 in nonseismic reinforced-concrete buildings, 250 in light steel-frame structures, 1300 in wood-frame commercial buildings, 2100 in wood-frame dwellings, 100 who were outside but shielded by light buildings, 500 who were outside and unshielded, and 350 in underground shelters. In Nagasaki the industrial reinforced-concrete buildings provided sufficient data to draw mortality and injury curves, but the results and construction were so similar to the seismic reinforced-concrete buildings that the two categories were considered to be identical.

The total number of people in a particular shielding category is not the only factor related to the accuracy of a curve derived from that data. The distribution of the data with respect to the horizontal range from the hypocenter is also important. In Nagasaki some of the horizontal range distributions of recorded cases are quite poor. However, in both cities the most reliable curves are those defined by the data from wood-frame dwellings. Since there are about 9300 case histories in Hiroshima for wood-frame dwellings and since the horizontal range distribution is good, these curves are by far the most accurate from a statistical viewpoint.

C. TOTAL MORTALITY CURVES FROM THE HIROSHIMA DATA

Because of the lack of data available at horizontal ranges near the hypocenter, these sections of the mortality curves presented in Fig. 34* are more uncertain than are the sections farther out. However, weapons-effects data are of considerable use in deriving the sections of the curves at the close-in ranges.

*All of the figures are presented at the end of this chapter.

The mortality curve for seismic reinforced-concrete buildings is nearly identical with the equivalent curve presented in DC-FR-1028. However, the tail on the new mortality curve is somewhat shorter than the previous one.

The basements and lower floors of seismic reinforced-concrete buildings appear to offer the lowest mortality rate at any given horizontal range. The middle and upper floors predict considerably higher mortality at any given range and do not seem to differ greatly from each other. The mortality curve for the entire seismic reinforced-concrete building appears to be about mid-way between the curves for the basements and lower floors and those of the middle and upper floors.

The mortality curve for nonseismic reinforced-concrete buildings is considerably higher than that for seismic buildings over most of the ranges of interest. However, at horizontal ranges beyond 3000 feet the two mortality curves tend to merge.

The 100-percent mortality point for wood-frame dwellings is slightly farther from the hypocenter than the curve derived previously in DC-FR-1028. However, for horizontal ranges from 2500 to 5500 feet the new mortality curve is considerably lower than the previous one.

A new category, wood-frame commercial buildings, appears to be more similar to the American wood-frame construction than does the Japanese wood-frame-dwelling category. The 100-percent mortality point for both wood-frame dwellings and wood-frame commercial buildings occurs at about the same horizontal range. However, for horizontal ranges between 2500 and 5000 feet the mortality curve for wood-frame commercial buildings is somewhat lower.

DC-FR-1028 does not contain mortality curves for light steel-frame industrial structures or vehicles in Japan. Both of these mortality curves appear to be lower than that for wood-frame commercial buildings and, in general, somewhat higher than that for nonseismic reinforced-concrete structures. The 100-percent mortality point for the light steel-frame industrial structures and vehicles occurs at a horizontal range comparable to that for wood-frame commercial buildings. The mortality curves for light steel-frame industrial buildings and vehicles also drop off similarly as a function of horizontal range.

The new 100-percent mortality point for persons who are outside but shielded by light buildings occurs about 400 feet farther out than the curve presented in DC-FR-1028. However, the new mortality curve drops off more rapidly. The largest difference occurs between the mortality curves in the mid-horizontal ranges near 3000 feet.

The new mortality curve for the outside-unshielded category is considerably lower than the previous curve in DC-FR-1028 at all horizontal ranges, but especially for ranges between 3500 feet and 6000 feet. This result is probably due to the clothing worn by the persons in the two samples. In DC-FR-1028 almost all of the data were derived from persons working on firebreaks who were lightly clothed. However, the new data base is much broader, and the average amount of clothing is undoubtedly greater.

D. TOTAL MORTALITY CURVES FROM THE NAGASAKI DATA

The total mortality curves for the various shielding locations in Nagasaki, presented in Fig. 35, are similar in character to those in Hiroshima except that, in general, they are somewhat higher at any given horizontal range.

The total mortality curve for seismic reinforced-concrete buildings in Nagasaki appears to be separated less from the nonseismic buildings than was the case in Hiroshima. However, the total mortality curve for the seismic buildings in Nagasaki is significantly higher than its counterpart in Hiroshima at all horizontal ranges. The associated total mortality curves by floor appear to behave similarly.

The total mortality curve for the nonseismic reinforced concrete buildings is considerably higher than its counterpart in Hiroshima for horizontal ranges within 3000 feet of the hypocenter. These data are an example of one of the few instances where the statistical accuracy is better in Nagasaki, which has about five times as many case histories as Hiroshima.

The total mortality curve for wood-frame commercial buildings has a steeper descent than either of the curves for seismic reinforced-concrete or nonseismic reinforced-concrete buildings. However, the curve for wood-frame commercial buildings is considerably higher than the other two curves out to a range of 3000 feet. Beyond 3000 feet all three total mortality curves tend to merge. The statistical accuracy of the Nagasaki curve for wood-frame commercial buildings is less than for Hiroshima, but it is still very good.

The total mortality curve for the wood-frame dwellings predicts a higher mortality rate than does the curve for wood-frame commercial buildings. However, both depart the 100-percent mortality mark at about the same horizontal range. The curve for wood-frame dwellings is by far the most accurate of any of the total mortality curves in Nagasaki although it fails to approach the statistical accuracy of the corresponding curve in Hiroshima.

The total mortality curve for light steel-frame structures is lower than either wood-frame commercial buildings or wood-frame dwellings. The statistical reliability of this curve is roughly the same as its counterpart in Hiroshima.

The total mortality curve for persons outside but shielded by light buildings remains somewhat less than the curves for either the wood-frame commercial buildings or the wood-frame dwellings. The statistical accuracy for this curve is considerably less than its counterpart in Hiroshima, which had thirteen times as much data.

The total mortality curve for the outside-unshielded category lies well beyond the curves for any of the other shielding categories. It is also significantly higher than the corresponding curve in Hiroshima. Unfortunately, the statistical accuracy of this curve is considerably less than for Hiroshima, which had about five times as many case histories.

According to the curves, the safest place to be in either city is in underground shelters. The predicted maximum mortality rate is 60 percent at ground zero in Nagasaki, and there are no predicted mortalities beyond 5000 feet from the hypocenter. Unfortunately, the statistical accuracy of these data are not very good, especially at the critical ranges near the hypocenter.

E. TOTAL INJURY CURVES FROM THE HIROSHIMA DATA

These curves are presented in Figs. 36 through 47. The total number of injuries in seismic reinforced-concrete buildings appears to be somewhat less than the injuries presented in DC-FR-1028. However, the general shape of both total injury curves seems to be about the same. The injury data for seismic buildings by floor divisions seems to indicate that the injury curves for the various divisions are roughly the same, and about equal to the injury curve for the whole building. Nonseismic reinforced-concrete buildings also appear to have a very similar injury curve to that of the seismic buildings.

The total injury curve for wood-frame dwellings appears to peak at horizontal ranges somewhat closer to the hypocenter than does the one given in DC-FR-1028. Also, the peak value of the new injury curve is somewhat higher. Since the tails of both injury curves are about the same, it appears that the total number injured is somewhat greater as predicted by the new curve.

The total injury curve for wood-frame commercial buildings seems to peak at about the same horizontal range as that for wood-frame dwellings, but at a higher value. As the tails of both curves agree reasonably well, it appears that there are more injuries in wood-frame commercial buildings than in wood-frame dwellings.

The total injury curve for light steel-frame industrial buildings indicates that there are slightly fewer injuries than in wood-frame commercial buildings but more than in wood-frame dwellings. The injury-curve peaks for light steel-frame industrial and wood-frame commercial buildings appear to occur at about the same horizontal range, but the injury curve for the light steel-frame buildings drops off more rapidly.

Fewer injuries seem to occur to occupants of vehicles than any shielding location yet discussed. The peak of this total injury curve appears to be located at horizontal ranges comparable with the peak found on the injury curve for the outside-shielded category.

The total injury curve for those outside and shielded by light buildings peaks higher and at horizontal ranges closer to the hypocenter than does the corresponding curve in DC-FR-1028. However, the new curve drops off faster. In general, it appears that more injuries are predicted with the new curve.

The total injury curve for persons who are outside and unshielded appears to differ the most between the present study and that of DC-FR-1028. The present data indicate that the new injury curve peaks much closer to the hypocenter and that the predicted total number of injuries are significantly higher than those predicted earlier.

F. TOTAL INJURY CURVES FROM THE NAGASAKI DATA

Apparently the general character of all the total injury curves for the various shielding locations presented in Figs. 48 through 58 is about the same as for Hiroshima, with the exception of vehicles and basements of seismic reinforced-concrete buildings where insufficient data were present in Nagasaki to define meaningful curves. However, for this city there were enough data on underground shelters to define a curve. Both the injury and the mortality curves for underground shelters indicate that this shelter location is superior to all others from the standpoint of casualties.

The data for seismic reinforced-concrete buildings by floor divisions appear to define a set of total injury curves for lower, middle, and upper floors of very nearly the same general character as those defined by the Hiroshima data. The peaks of the total injury curves appear to occur between 500 and 1000 feet farther out. However, they attain about the same maximum values as their counterparts did in Hiroshima. The general shape of the total injury curve for entire seismic reinforced-concrete buildings is about the same as the corresponding curve in Hiroshima.

The total injury curve for nonseismic reinforced-concrete buildings is of the same general shape and has about the same peak value as the corresponding one in Hiroshima. However, its peak occurs about 500 feet farther out.

The total injury curve for wood-frame dwellings has the same general shape, but a significantly higher peak value, than the curve for Hiroshima. The peak value of the total injury curves occurs at approximately the same horizontal range in both cities. However, the curve for Nagasaki descends from its peak value more rapidly, so the total number of injured in the two cities does not appear to differ greatly.

The total injury curve for wood-frame commercial buildings has not only the same general shape as the corresponding curve in Hiroshima, but also approximately the same peak value, which occurs at about the same horizontal range.

The total injury curve for light steel-frame structures has a slightly higher peak value than the curve for Hiroshima although the shapes of the two curves are similar. The peaks also occur at about the same horizontal range.

The total injury curve for persons who were outside and shielded by light buildings has about the same shape as its counterpart in Hiroshima although it has a slightly higher peak value. Apparently, the Nagasaki curve peaks about 200 feet farther out.

The total injury curve for persons who were outside and unshielded appears to peak at about the same horizontal range as for Hiroshima, but it has a peak value of some ten percent less. The Nagasaki curve declines more rapidly with horizontal range; thus, it predicts fewer overall injuries. This effect could be due to a lower transmission coefficient in Nagasaki.

The total injury curve for underground shelters has the lowest peak value (occurs at hypocenter) of any of the total injury curves in either city. Since this curve also declines to zero at a faster rate than any other total injury curve, it is evident that it predicts fewer total injuries than the curves for any other shielding category in either city.

The comments concerning the relative statistical accuracy of the various total mortality curves apply directly to the associated total injury curves.

G. MORTALITY BY TYPE IN HIROSHIMA AND NAGASAKI

In both Hiroshima and Nagasaki the mortality data were quite scarce as compared to the injury data. In many of the shielding categories there were barely sufficient data to define a total mortality curve. Thus, the subdivision of these data by the various casualty mechanisms (blast, thermal, and nuclear) was not feasible. Therefore, mortality curves by type were not drawn for either Hiroshima or Nagasaki.

H. INJURY CURVES FOR BLAST, THERMAL, AND NUCLEAR RADIATION IN HIROSHIMA AND NAGASAKI

Injury curves were drawn by type (blast, thermal, and nuclear radiation) for the following shielding locations in Hiroshima and Nagasaki: lower, middle, and upper floors of seismic reinforced-concrete buildings, entire seismic reinforced-concrete buildings, non-seismic reinforced-concrete buildings, light steel-frame structures, wood-frame commercial buildings, wood-frame dwellings, outside-shielded (by light buildings), and outside-unshielded. In addition, injury curves by type were drawn for basements of seismic reinforced-concrete buildings and for vehicles in Hiroshima; curves were also drawn for underground shelters in Nagasaki. These injury curves are also presented in Figs. 36 through 58.

Four injury curves were drawn on the same graph for each shielding category. These four curves were for total, blast, thermal, and nuclear injuries. In some cases there were insufficient data to define a curve properly, so a "best estimate" was drawn as indicated by the dashed curves. These curves were constructed on the basis of the available data and predicted weapons effects as well as the behavior of other similar, and more adequately defined, injury curves for structurally-related shielding categories. It appears that the resulting curves are reasonably consistent with the physical data and the best known weapons effects for the two cities.

The general discussions concerning the statistical accuracy of the data base, as well as the statements about the specific statistical reliability of the individual total mortality and injury curves, are directly applicable to these blast, thermal, and nuclear-radiation injury curves. As a matter of fact, any statistical uncertainty present for a given total injury curve is magnified by the subdivision of the total injuries into blast, thermal and nuclear-radiation injuries.

Note that the data base for these injury curves is identical to that used for the total mortality and injury curves.

FIG. 34

TOTAL MORTALITY CURVES FOR HIROSHIMA

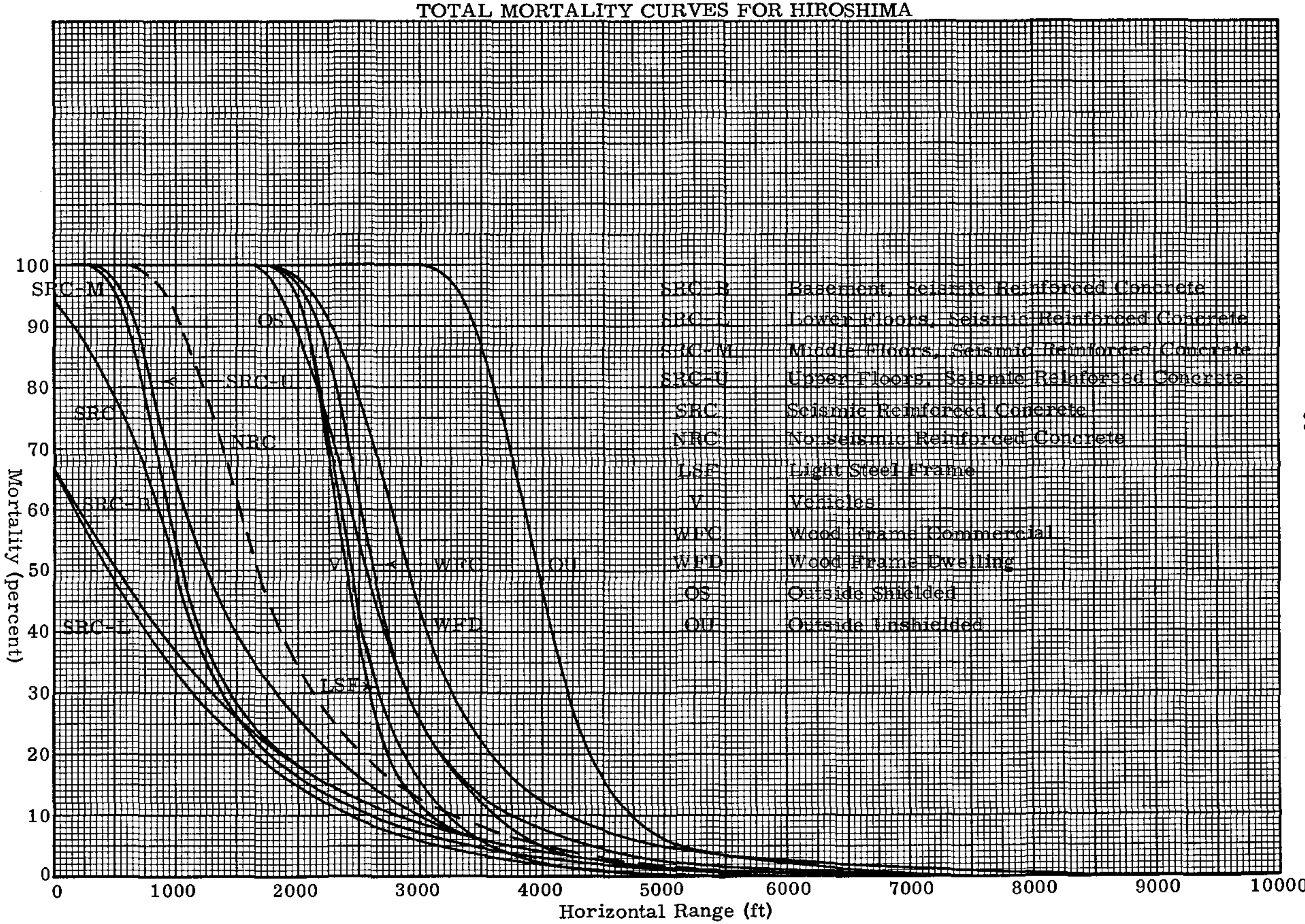


FIG. 35

TOTAL MORTALITY CURVES FOR NAGASAKI

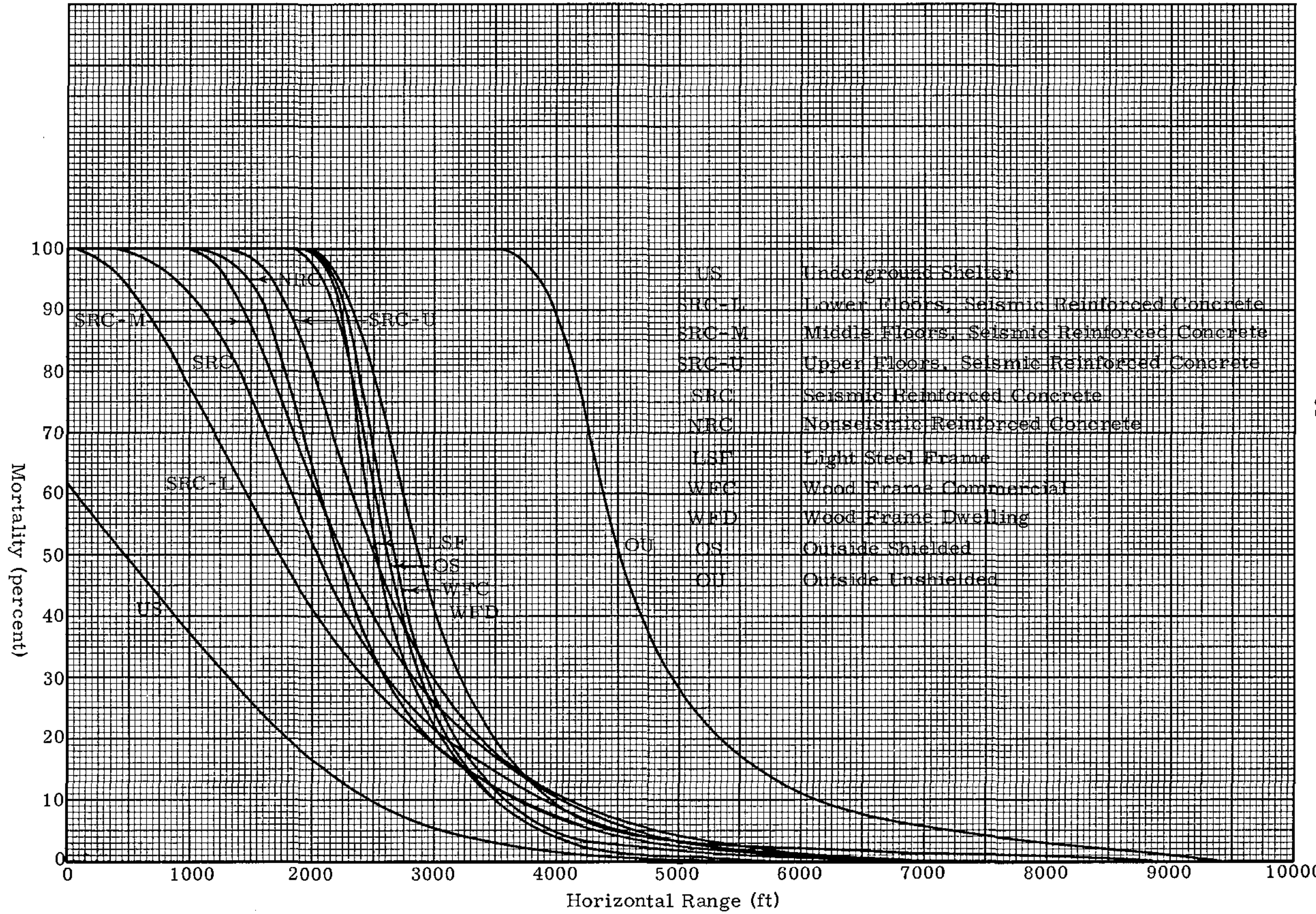


FIG. 36

HIROSHIMA INJURY CURVES FOR BASEMENTS OF SEISMIC REINFORCED-CONCRETE BUILDINGS

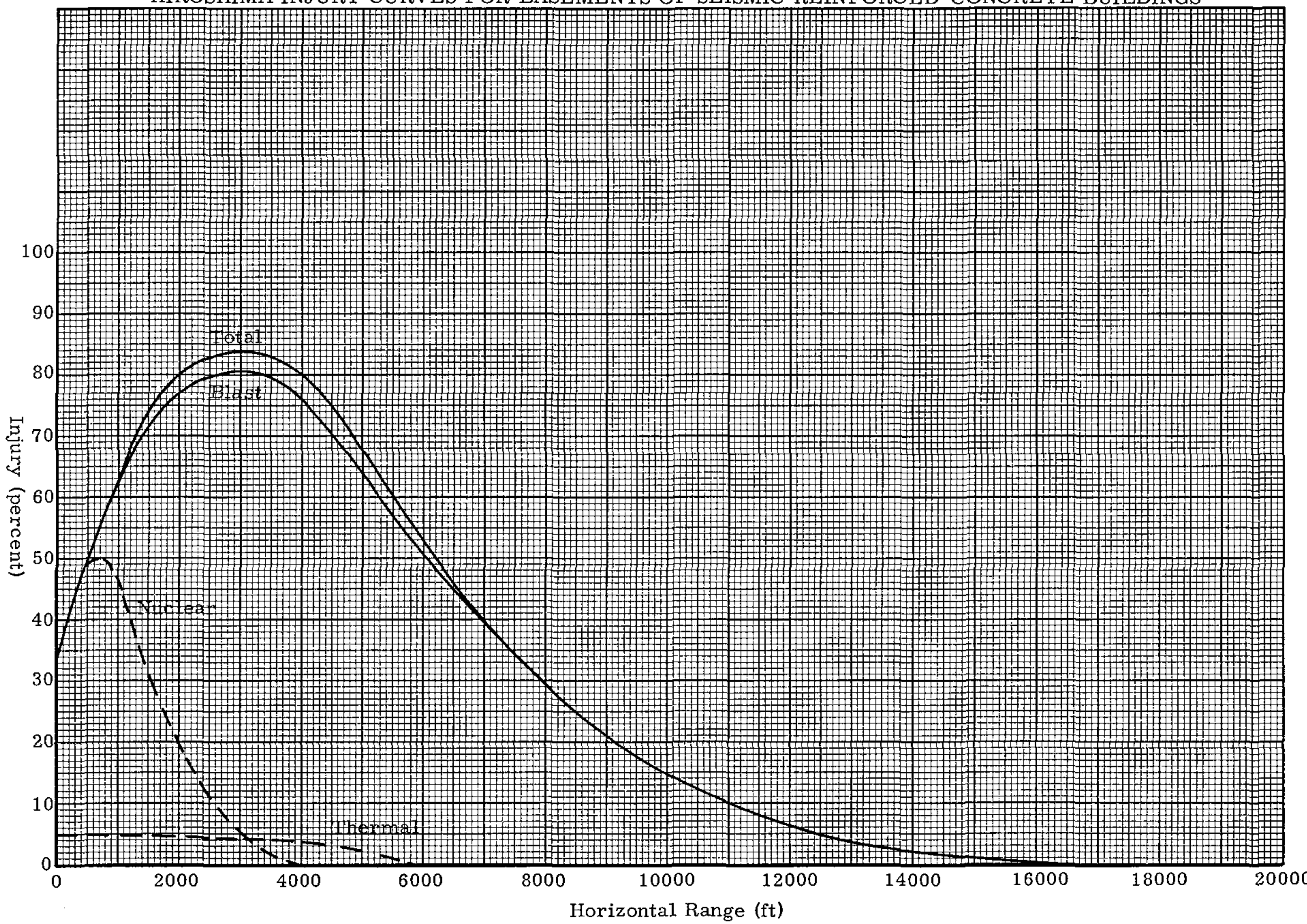


FIG. 37

HIROSHIMA INJURY CURVES FOR LOWER FLOORS OF SEISMIC REINFORCED-CONCRETE BUILDINGS

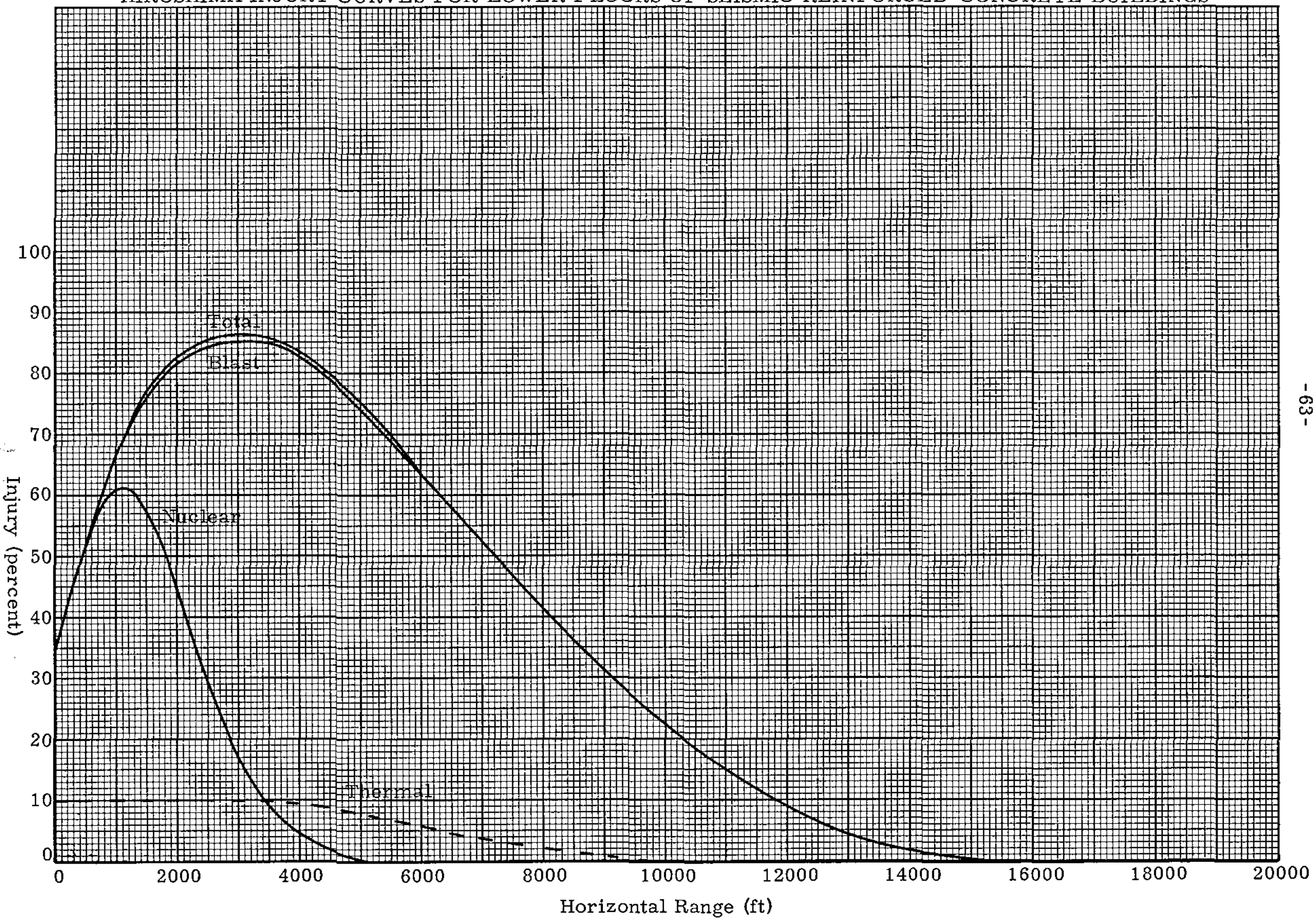


FIG. 38

HIROSHIMA INJURY CURVES FOR MIDDLE FLOORS OF SEISMIC REINFORCED-CONCRETE BUILDINGS

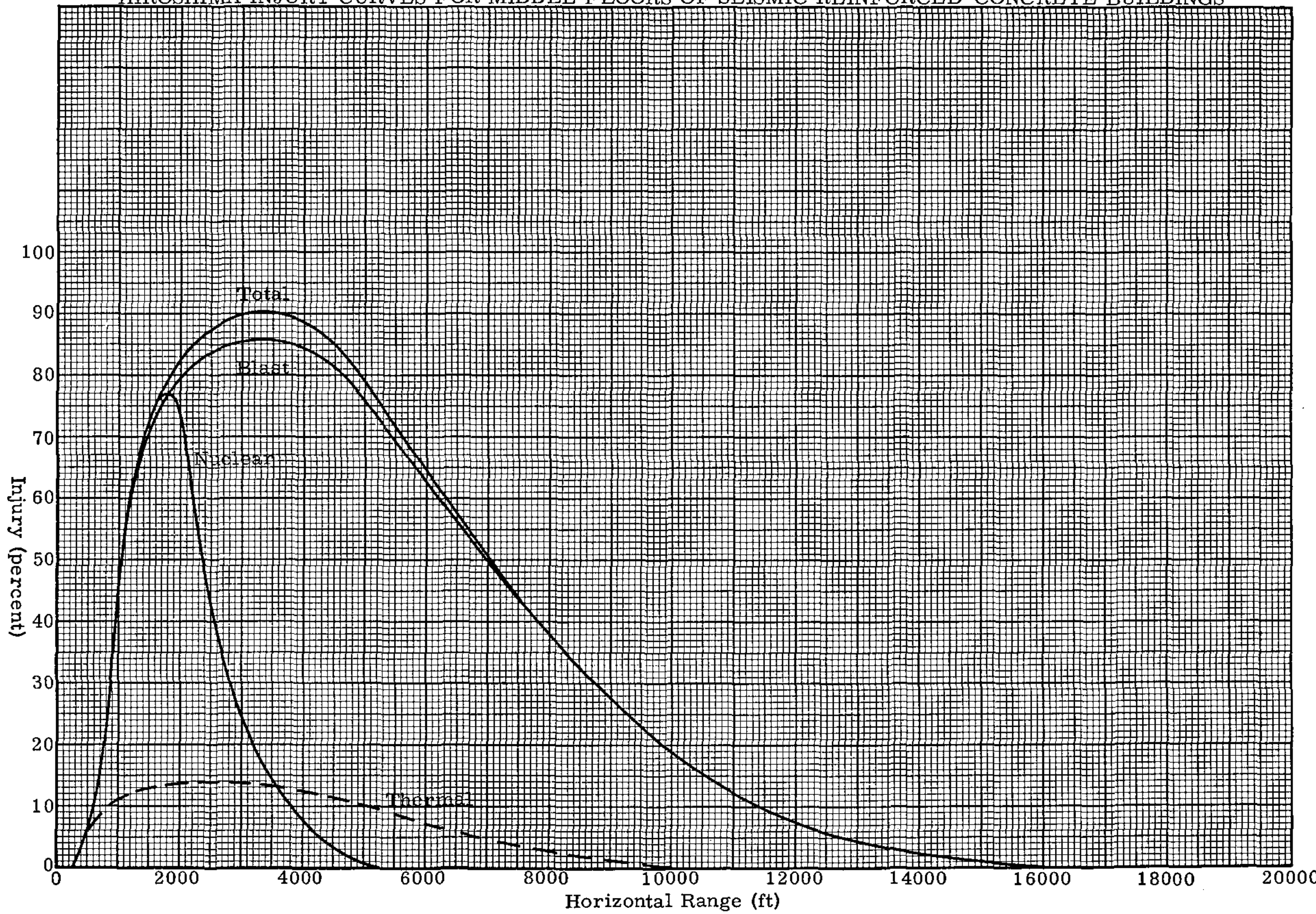


FIG. 39

HIROSHIMA INJURY CURVES FOR UPPER FLOORS OF SEISMIC REINFORCED-CONCRETE BUILDINGS

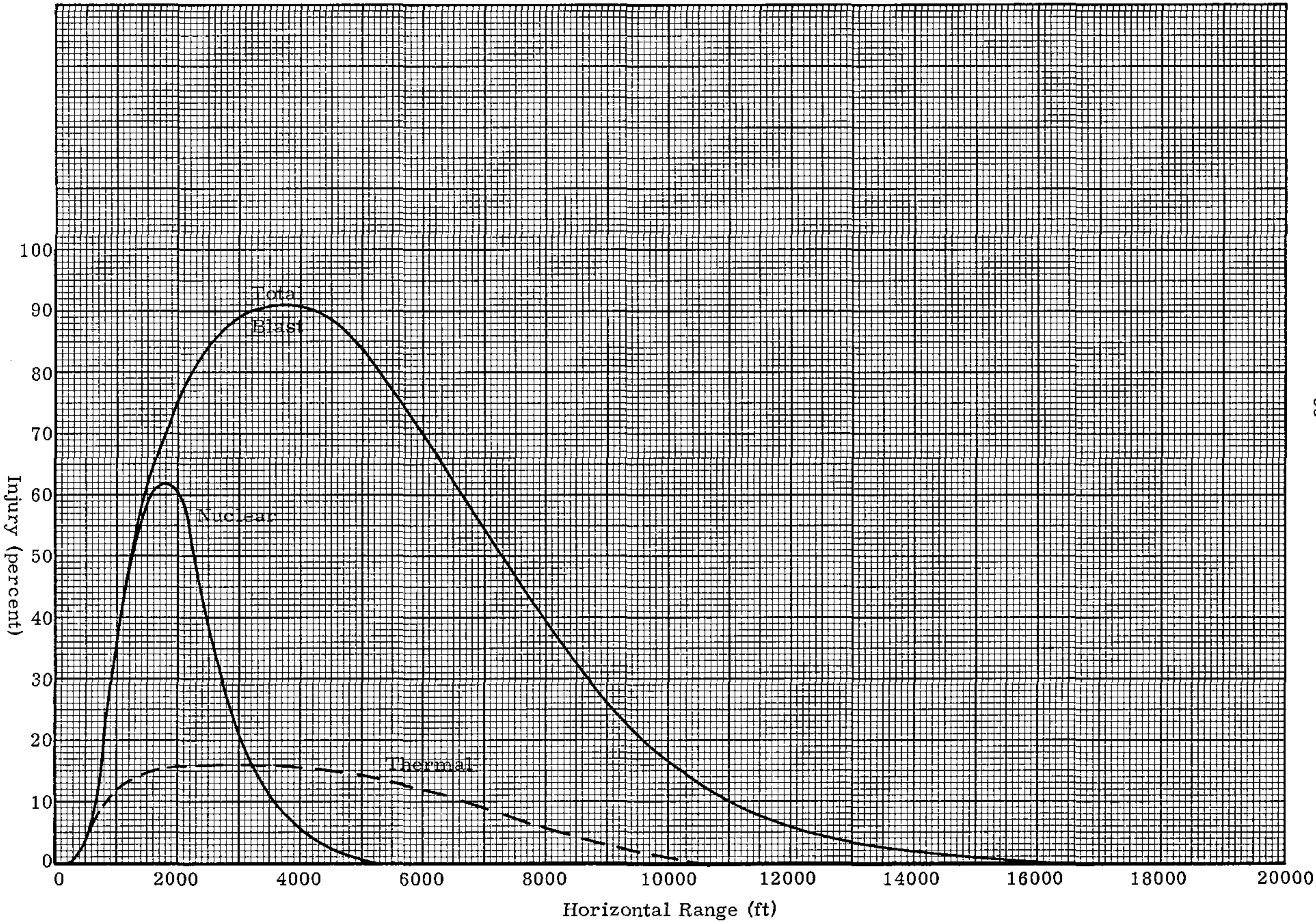


FIG. 40

HIROSHIMA INJURY CURVES FOR SEISMIC REINFORCED-CONCRETE BUILDINGS

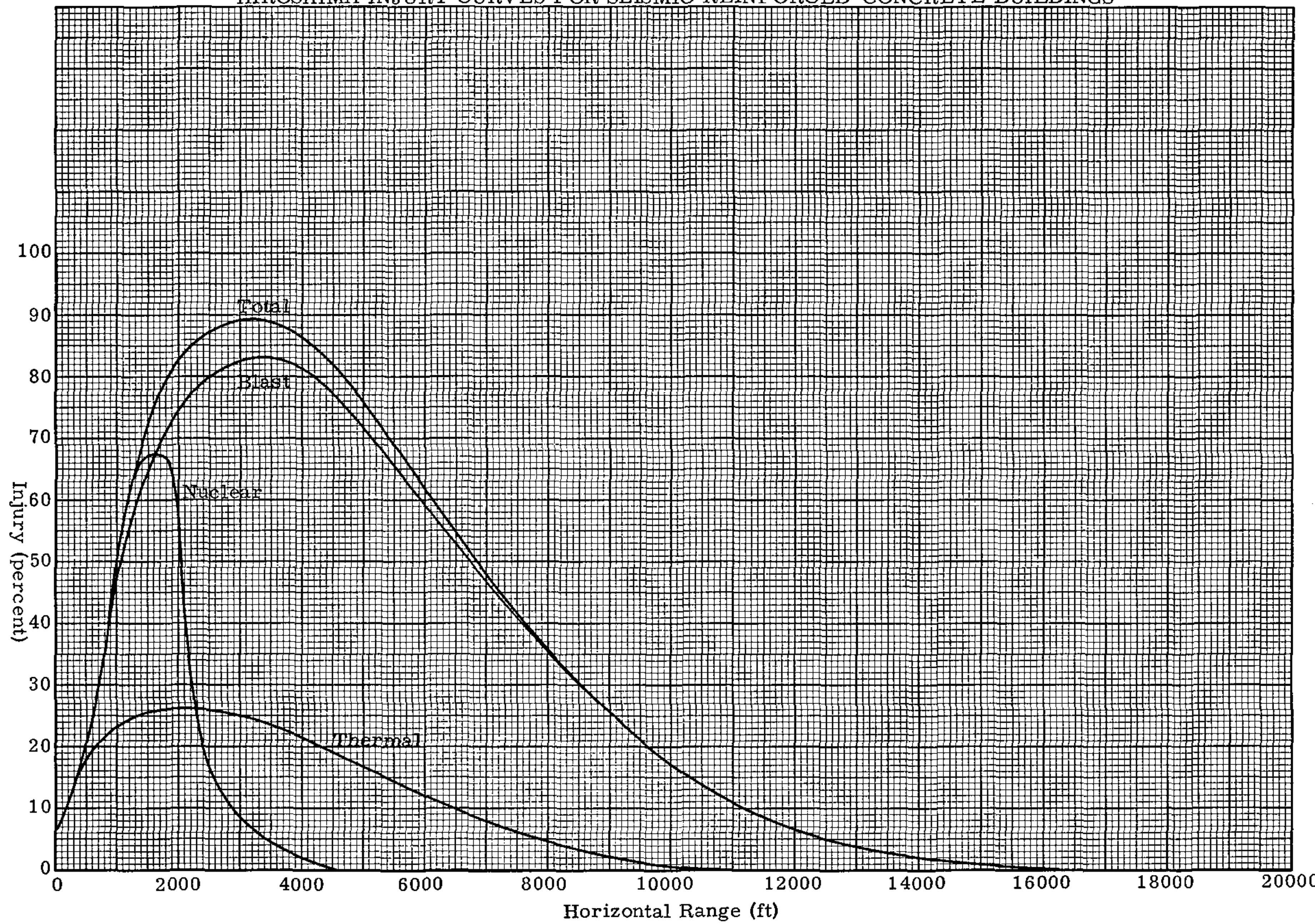


FIG. 41

HIROSHIMA INJURY CURVES FOR NONSEISMIC REINFORCED-CONCRETE BUILDINGS

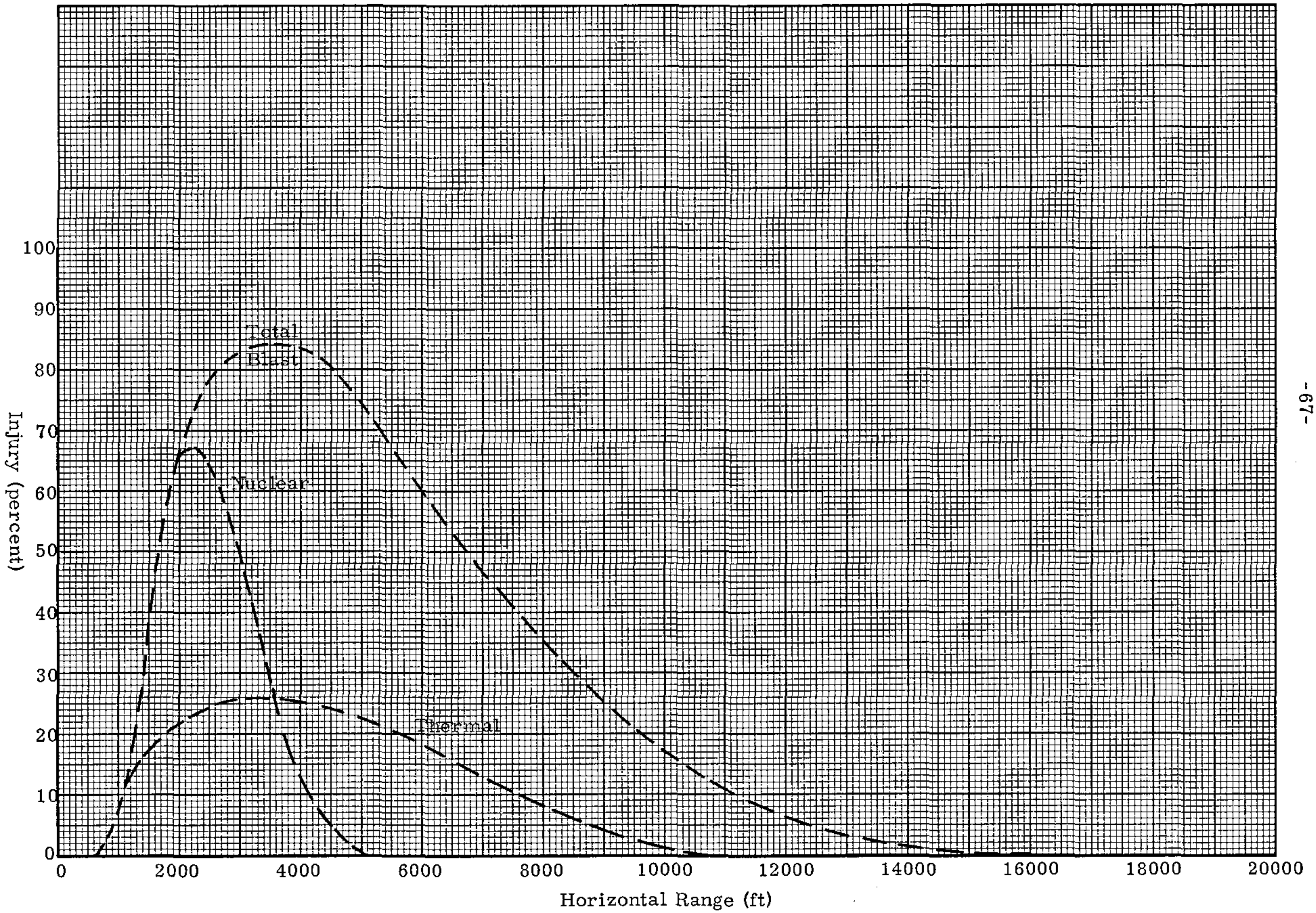


FIG. 42

HIROSHIMA INJURY CURVES FOR LIGHT STEEL-FRAME INDUSTRIAL BUILDINGS

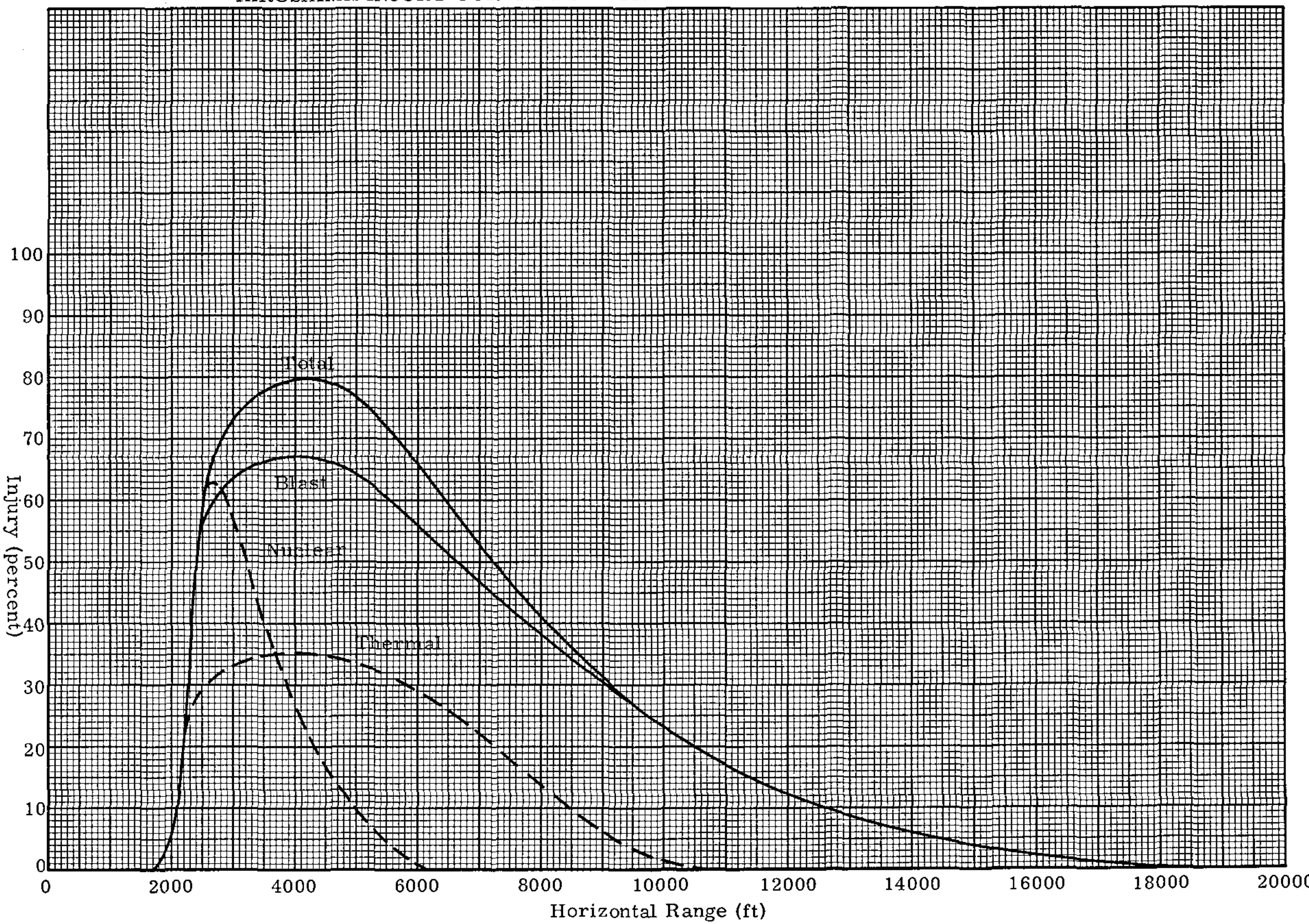


FIG. 43
HIROSHIMA INJURY CURVES FOR VEHICLES

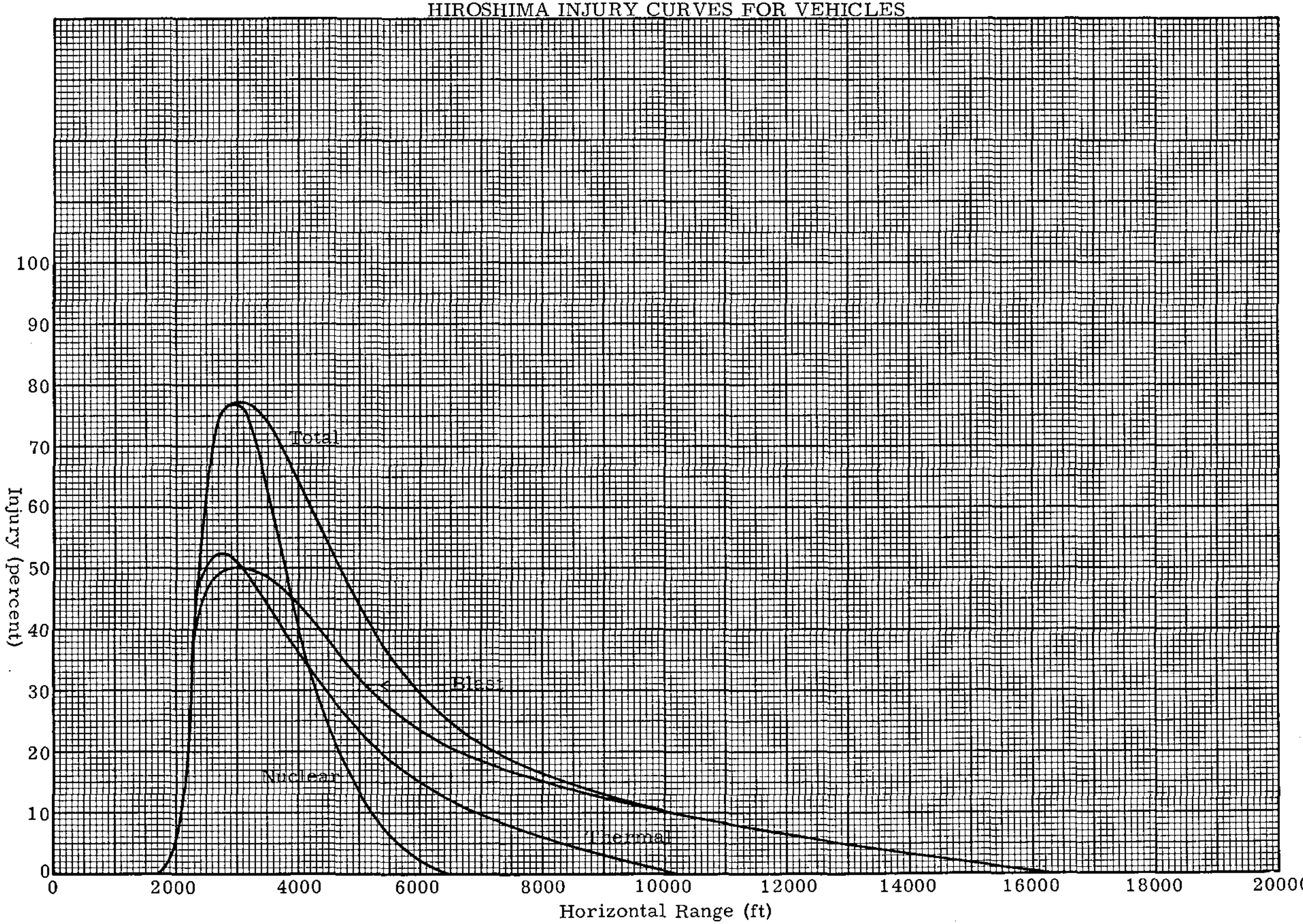


FIG. 44

HIROSHIMA INJURY CURVES FOR OUTSIDE-SHIELDED CATEGORY

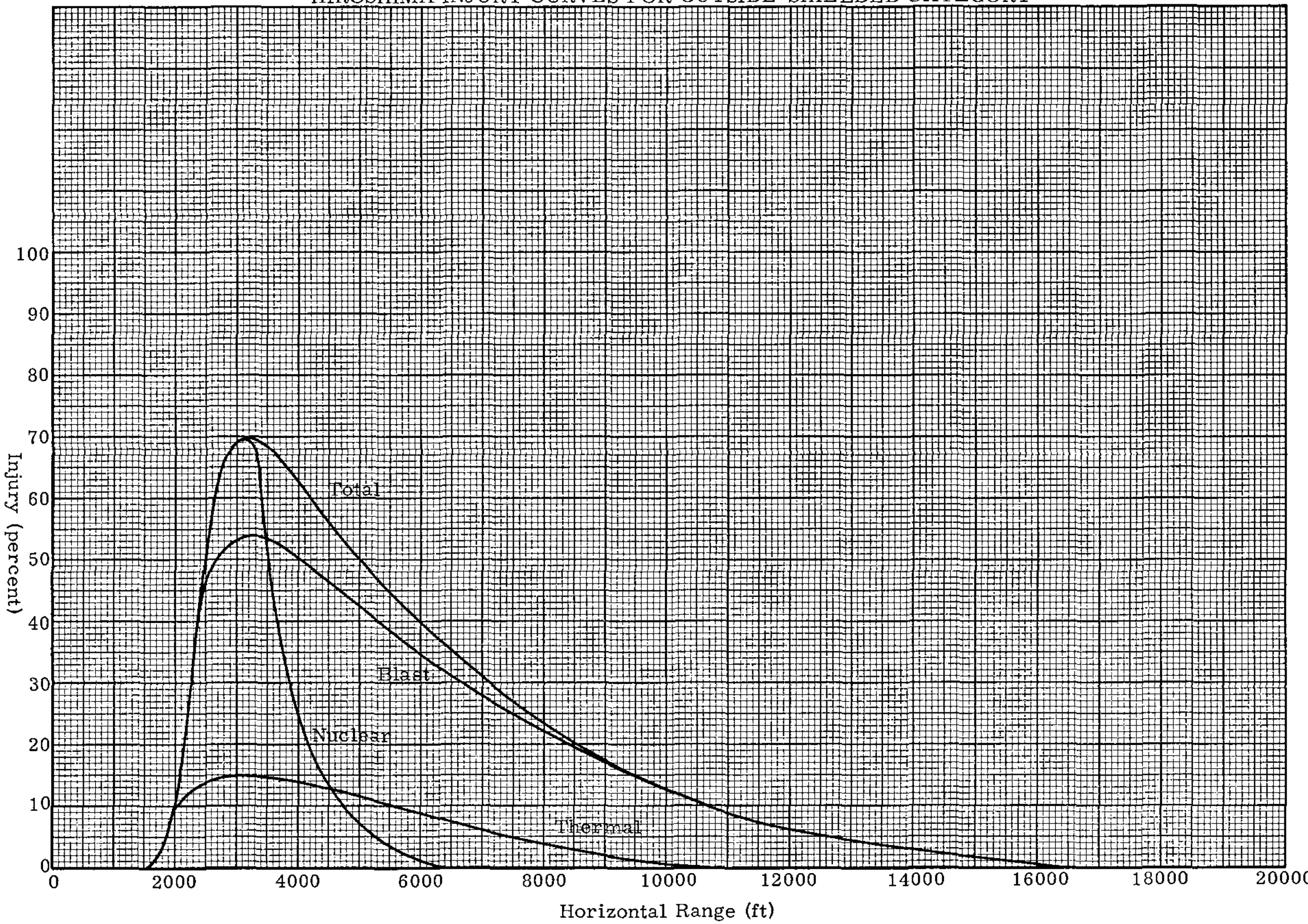


FIG. 45

HIROSHIMA INJURY CURVES FOR WOOD-FRAME COMMERCIAL BUILDINGS

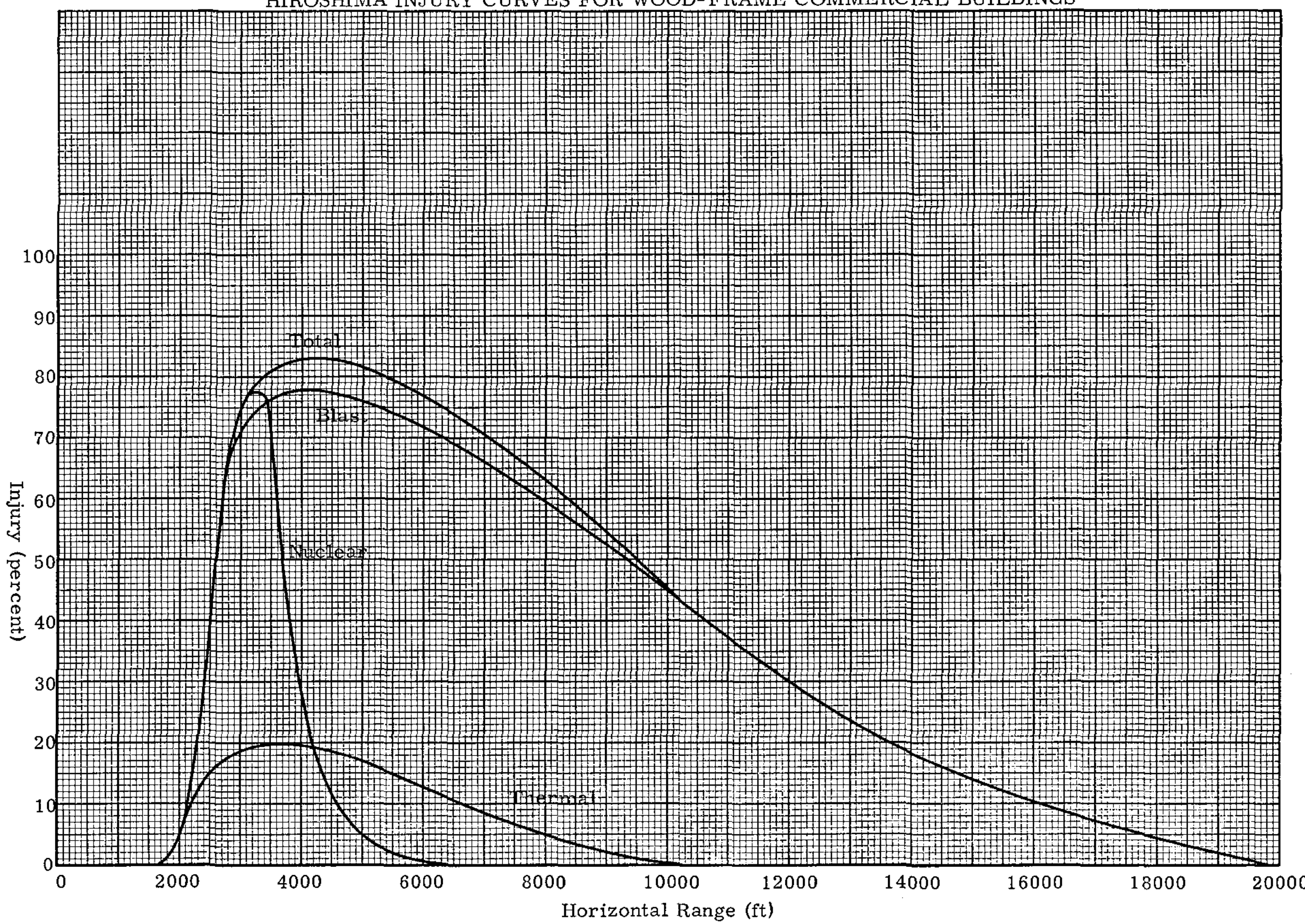


FIG. 46

HIROSHIMA INJURY CURVES FOR WOOD-FRAME DWELLINGS

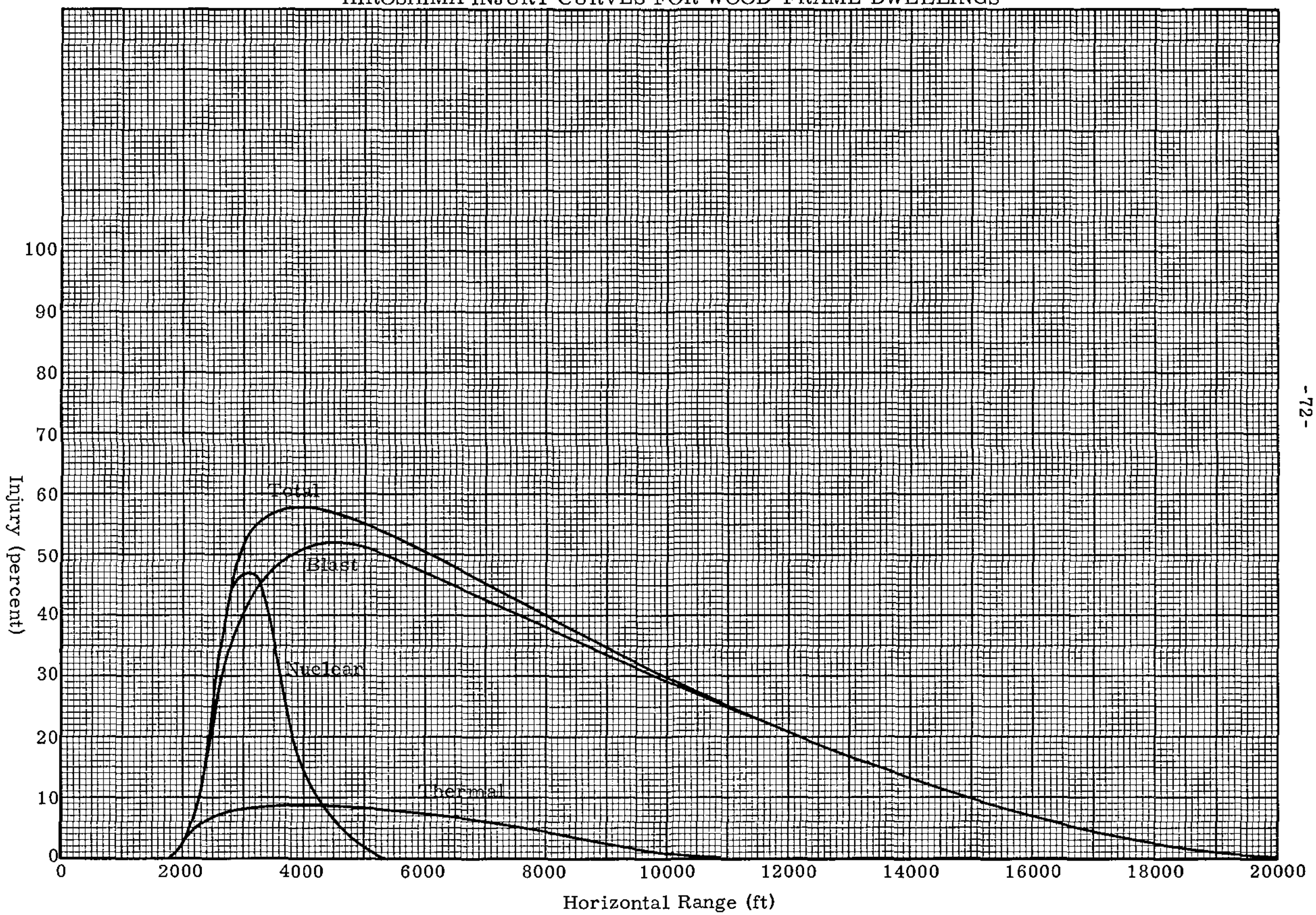


FIG. 47

HIROSHIMA INJURY CURVES FOR OUTSIDE-UNSHIELDED CATEGORY

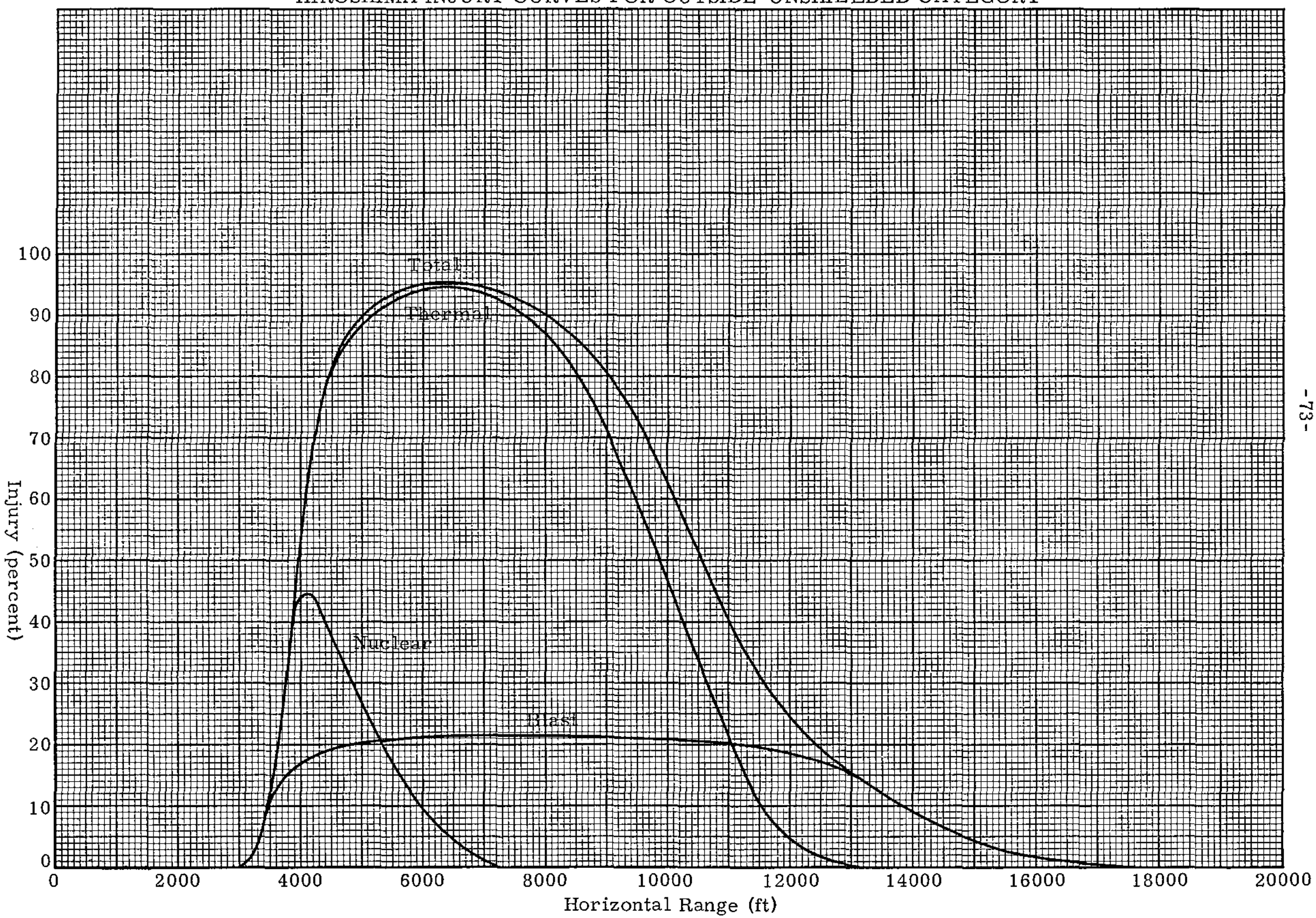


FIG. 48

NAGASAKI INJURY CURVES FOR MISCELLANEOUS UNDERGROUND SHELTERS

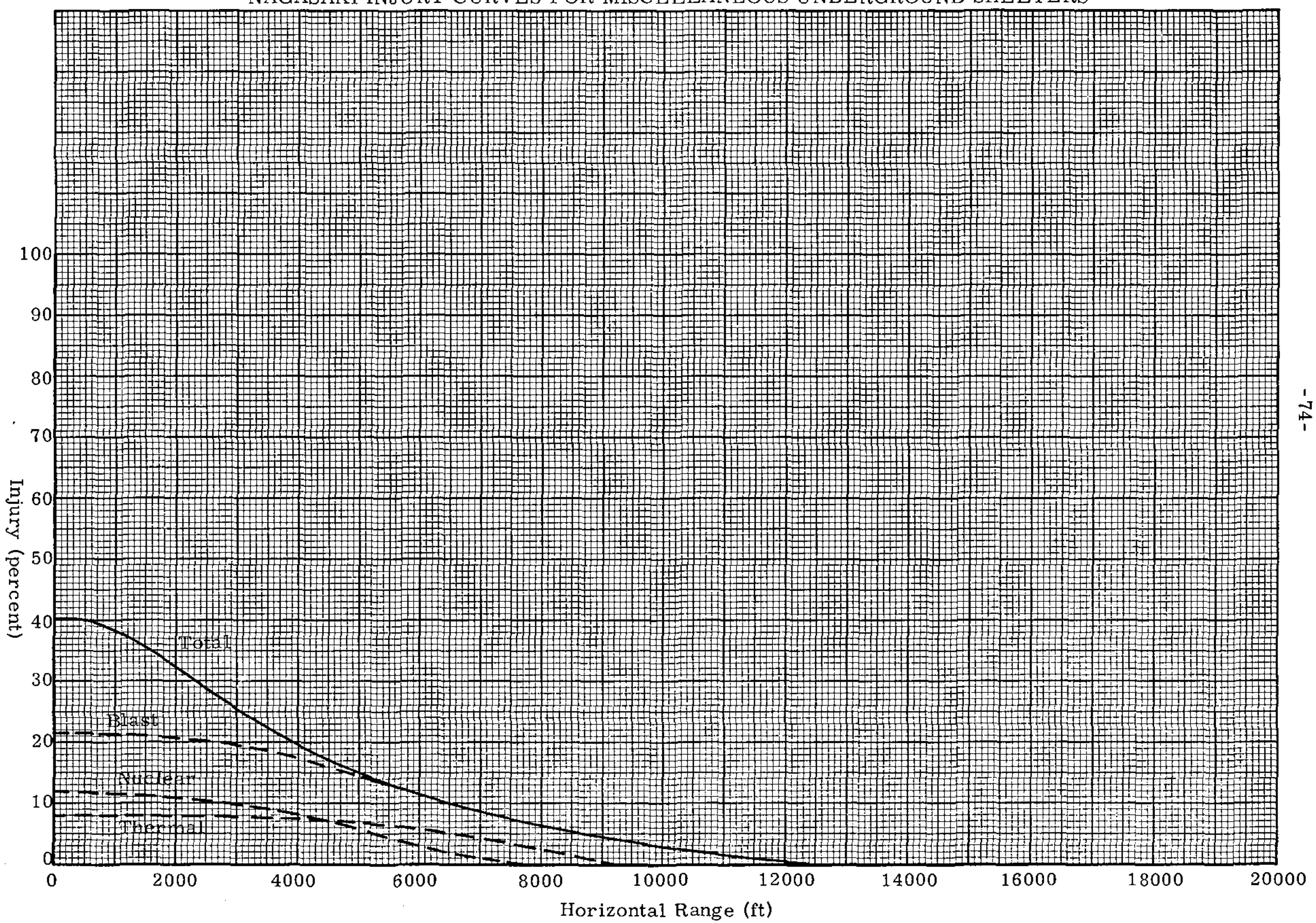


FIG. 49

NAGASAKI INJURY CURVES FOR LOWER FLOORS OF SEISMIC REINFORCED-CONCRETE BUILDINGS

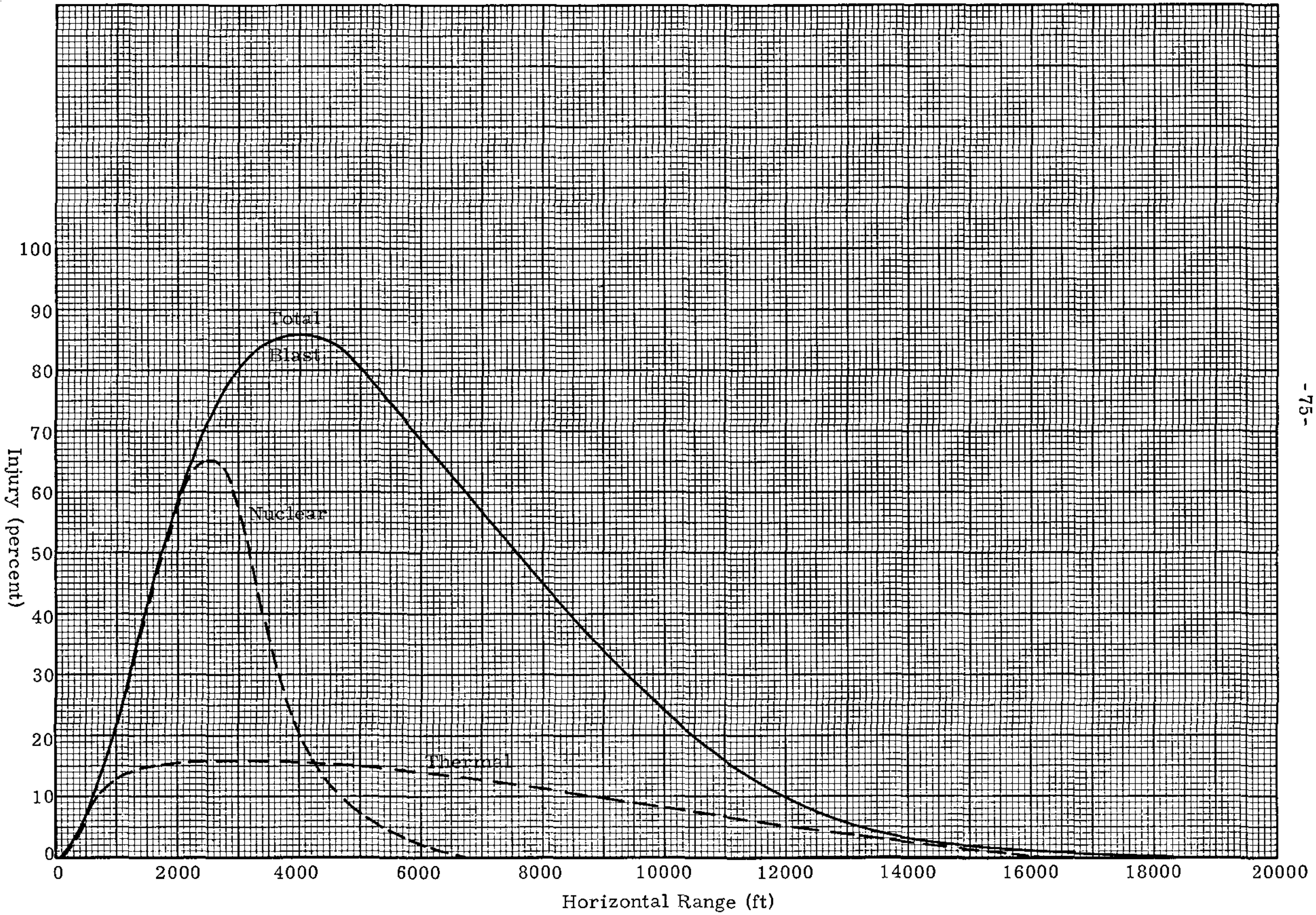


FIG. 50

NAGASAKI INJURY CURVES FOR MIDDLE FLOORS OF SEISMIC REINFORCED-CONCRETE BUILDINGS

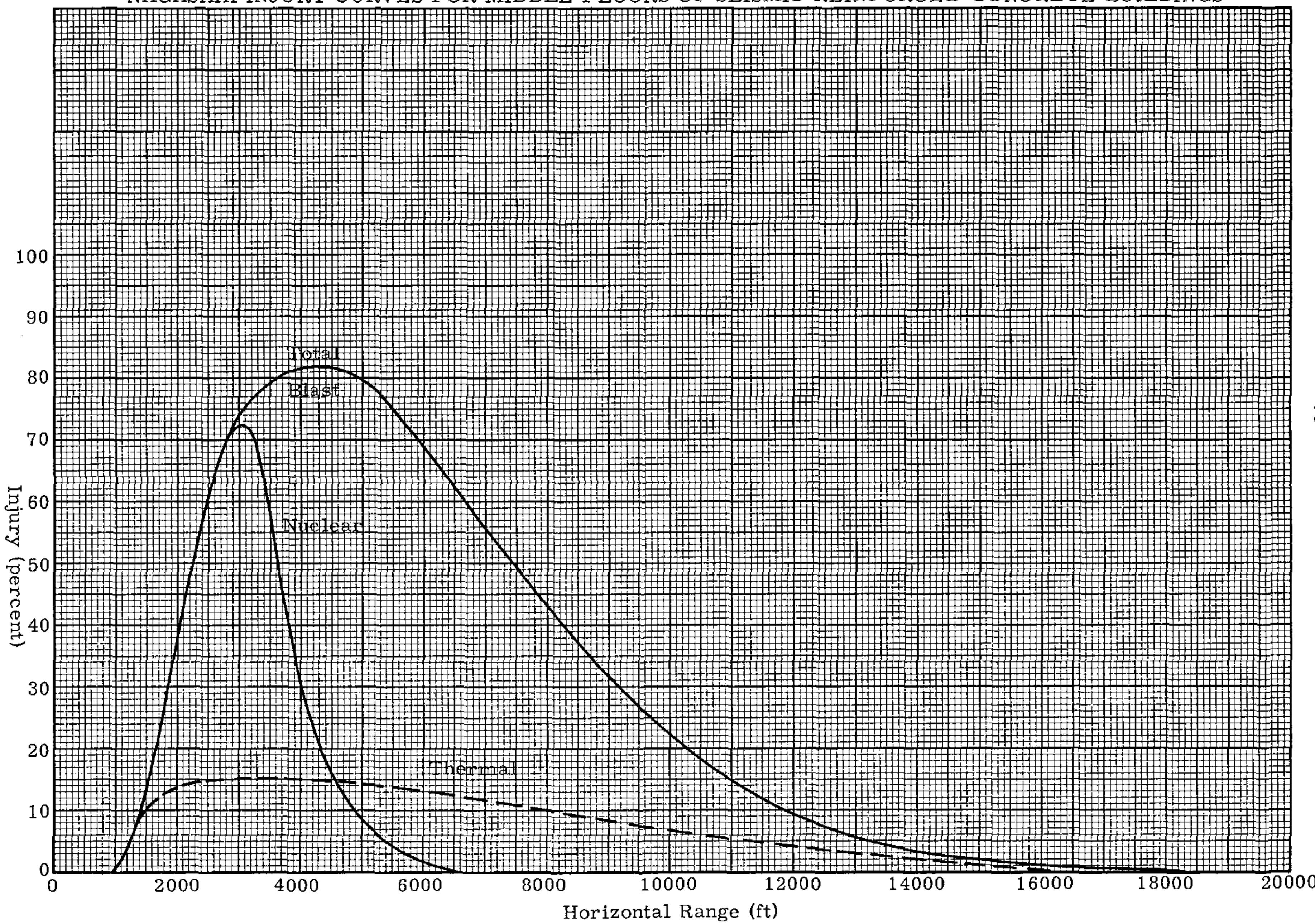


FIG. 51

NAGASAKI INJURY CURVES FOR UPPER FLOORS OF SEISMIC-REINFORCED-CONCRETE BUILDINGS

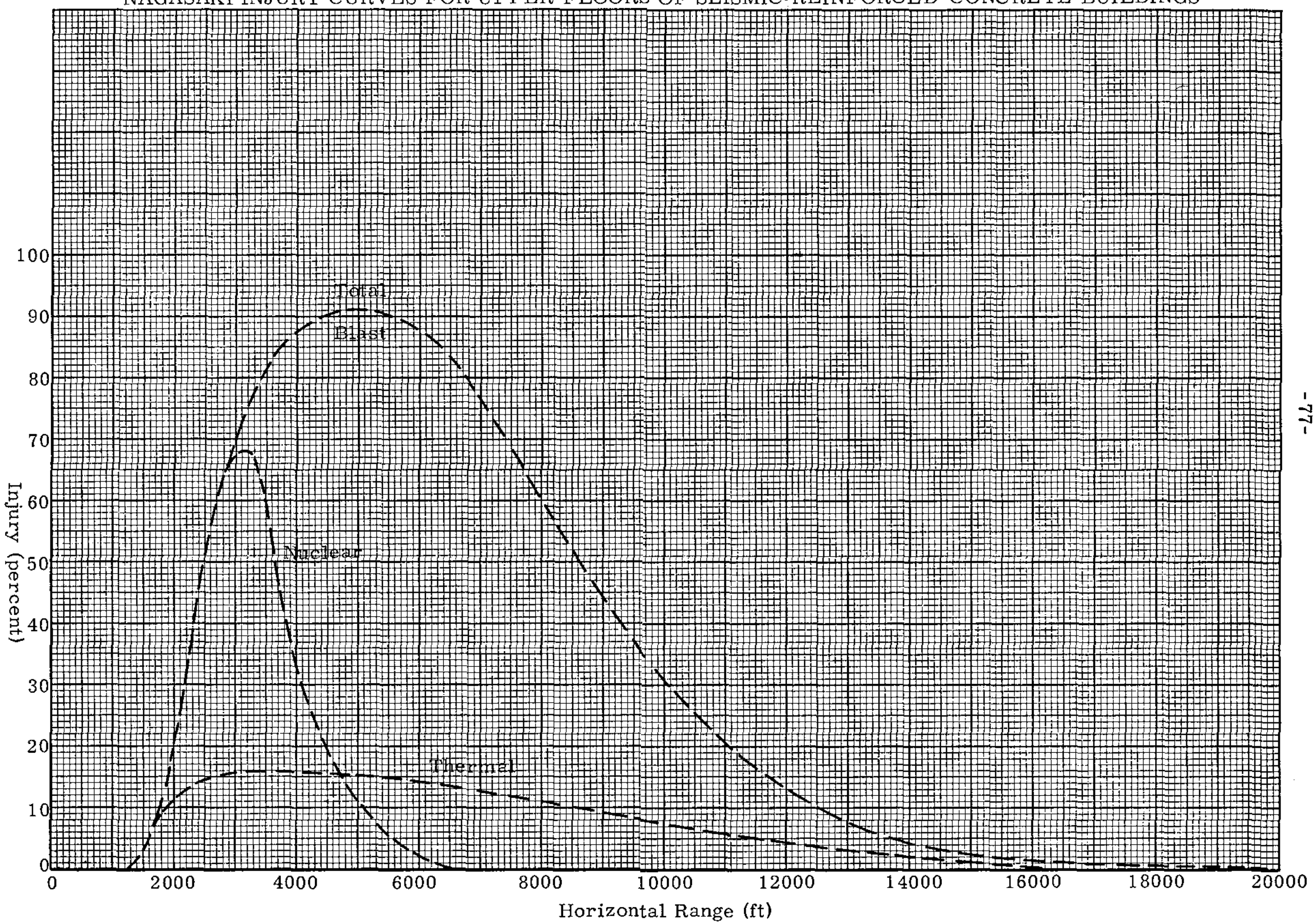


FIG. 52

NAGASAKI INJURY CURVES FOR SEISMIC REINFORCED-CONCRETE BUILDINGS

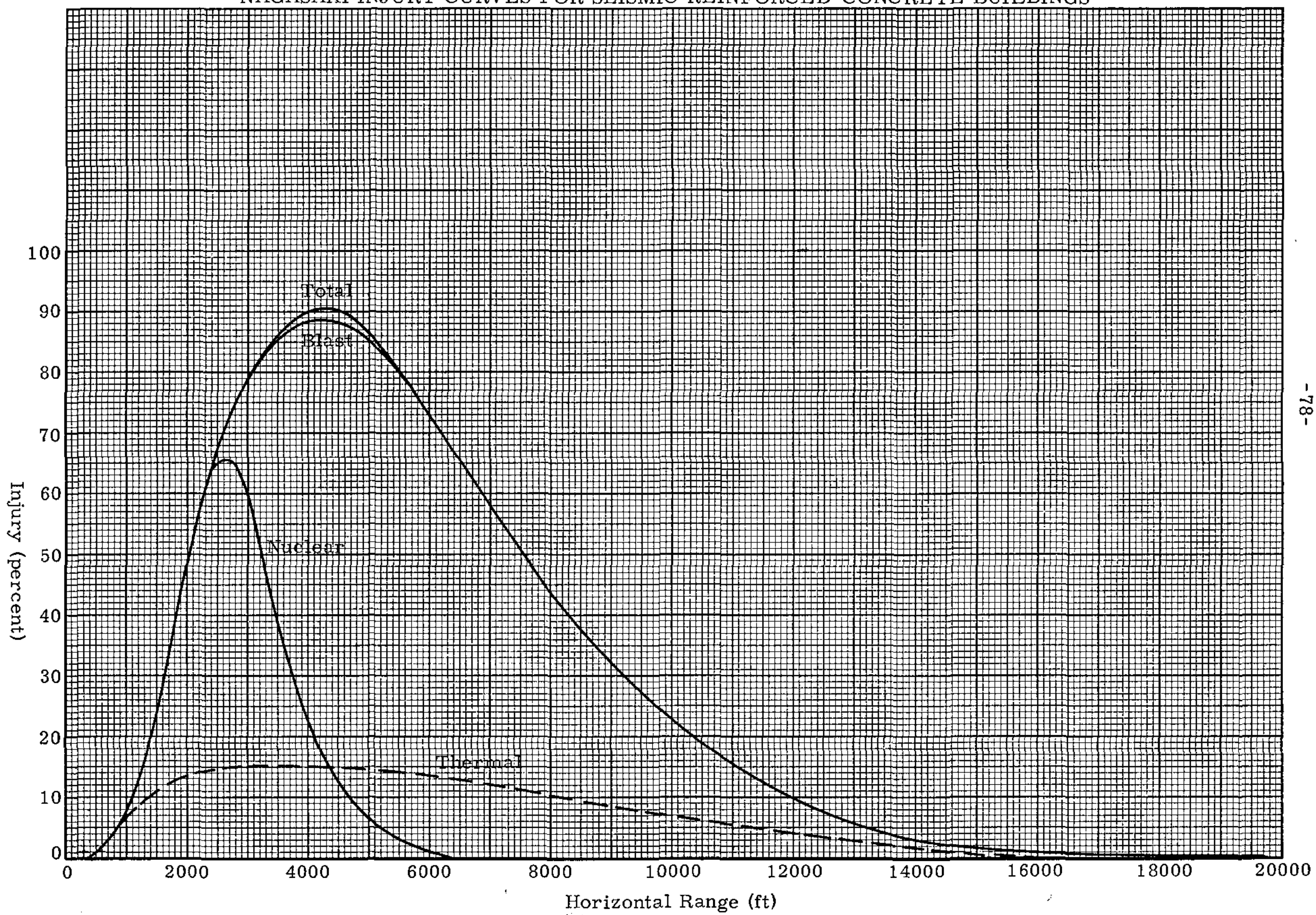


FIG. 53

NAGASAKI INJURY CURVES FOR NONSEISMIC REINFORCED-CONCRETE BUILDINGS

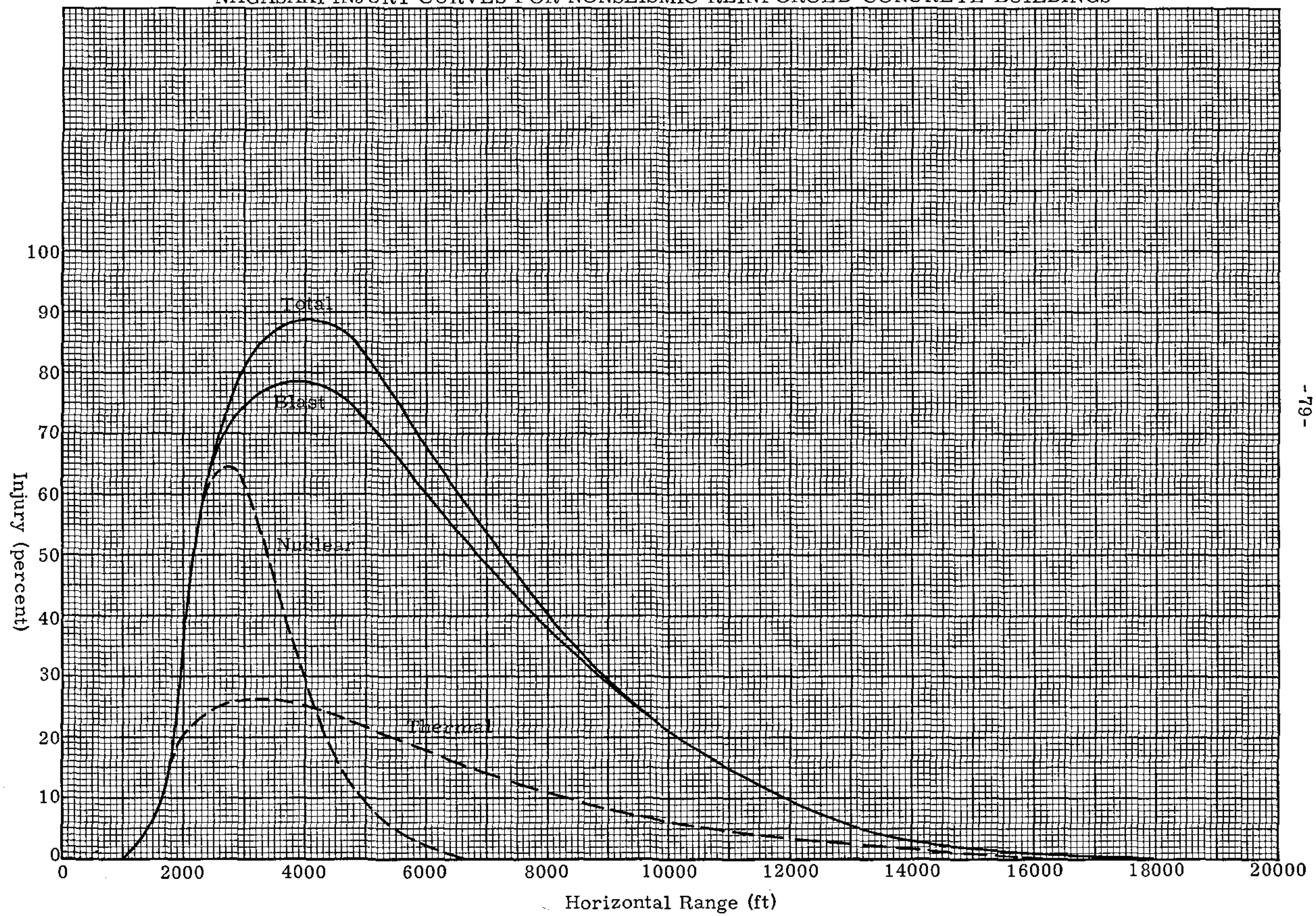


FIG. 54

NAGASAKI INJURY CURVES FOR LIGHT STEEL-FRAME INDUSTRIAL BUILDINGS

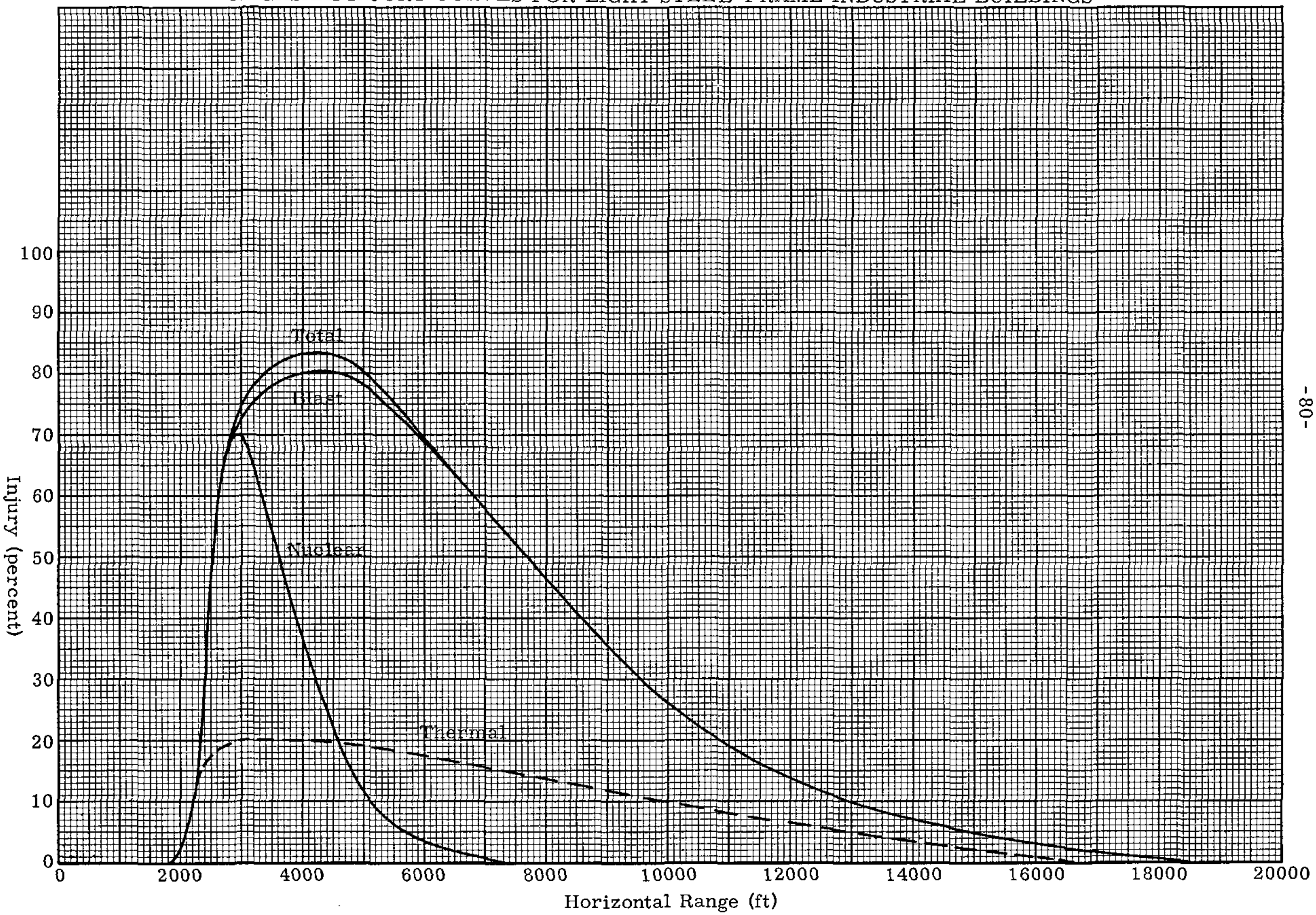


FIG. 55

NAGASAKI INJURY CURVES FOR OUTSIDE-SHIELDED CATEGORY

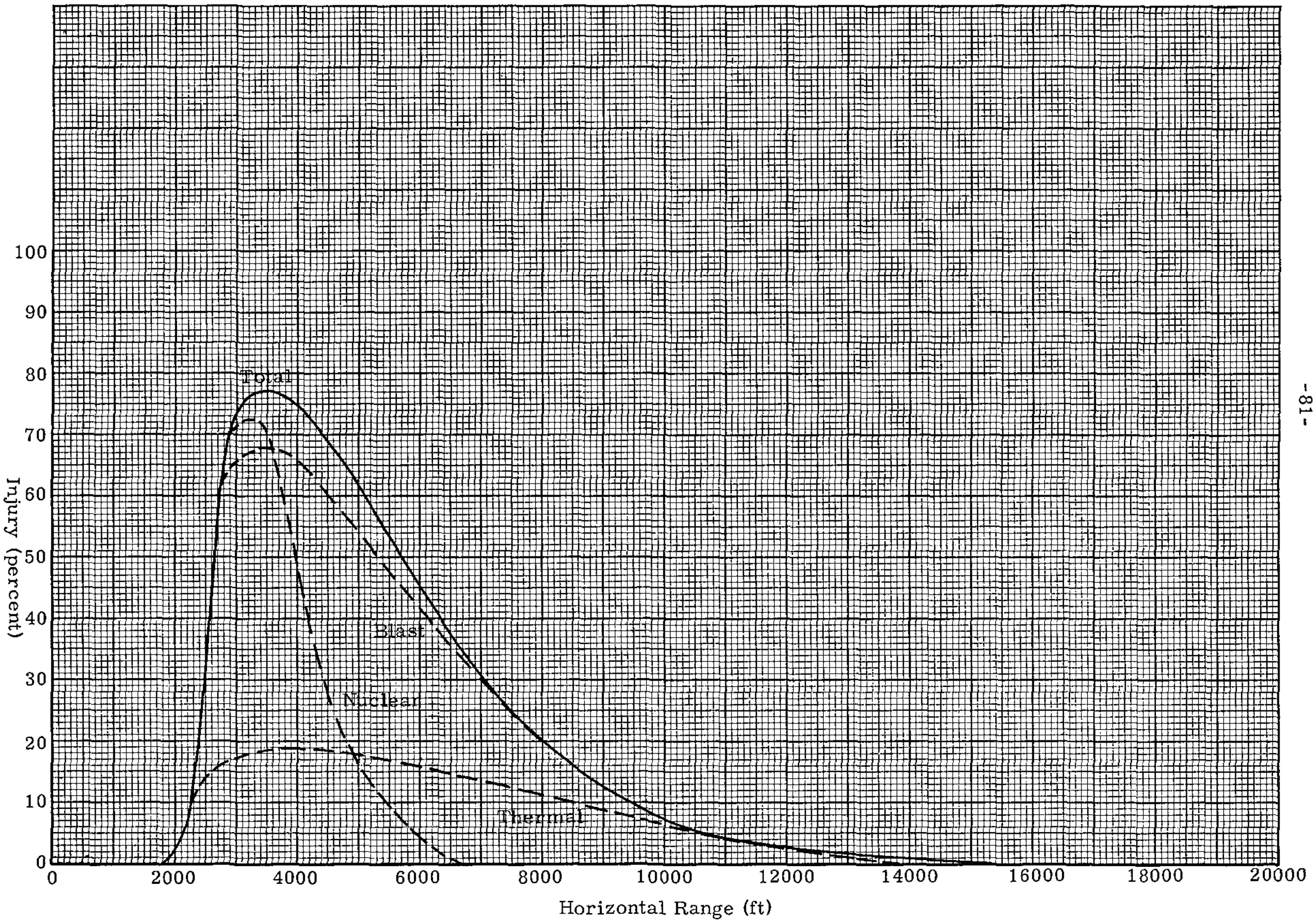


FIG. 56

NAGASAKI INJURY CURVES FOR WOOD-FRAME COMMERCIAL BUILDINGS

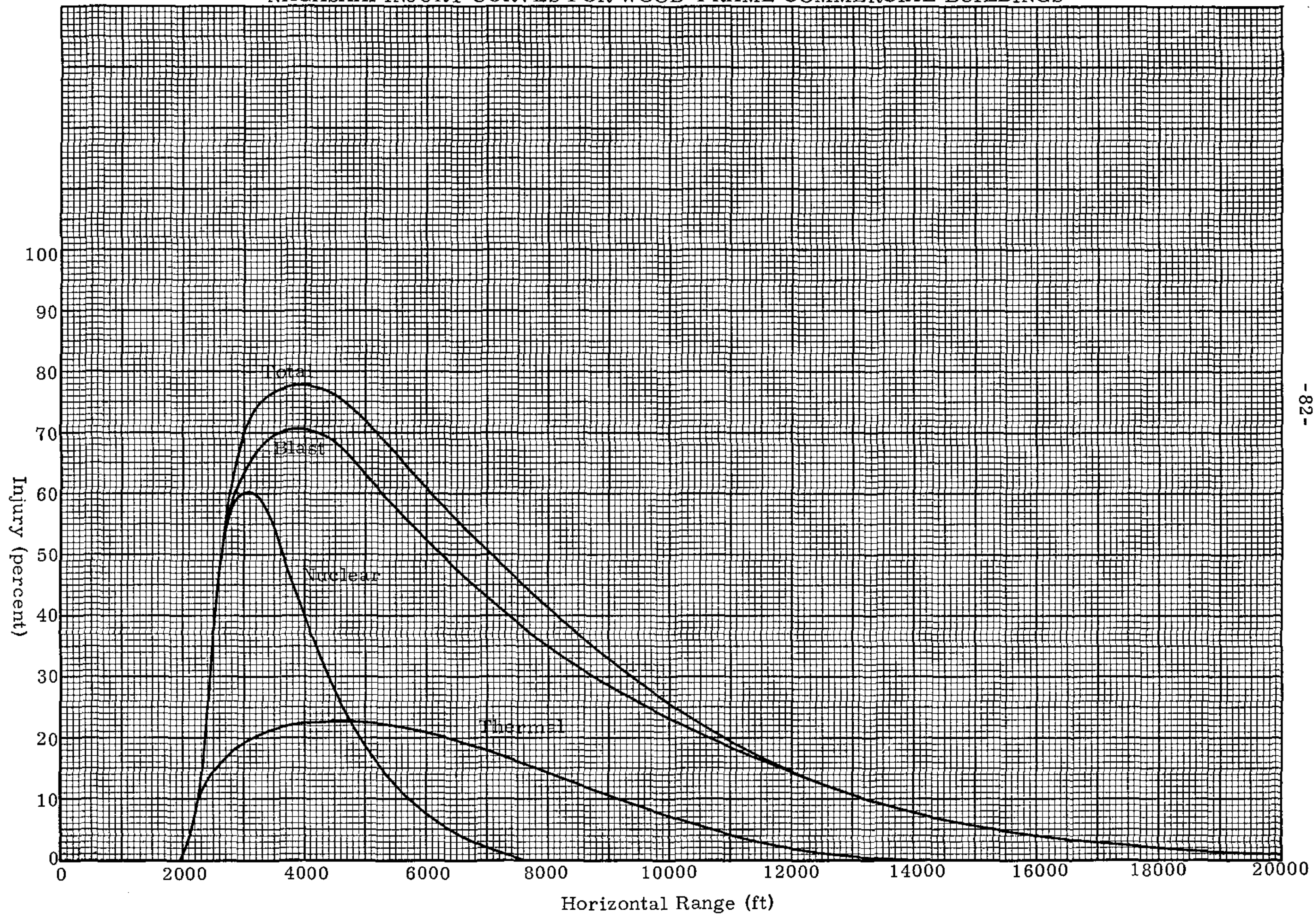


FIG. 57

NAGASAKI INJURY CURVES FOR WOOD-FRAME DWELLINGS

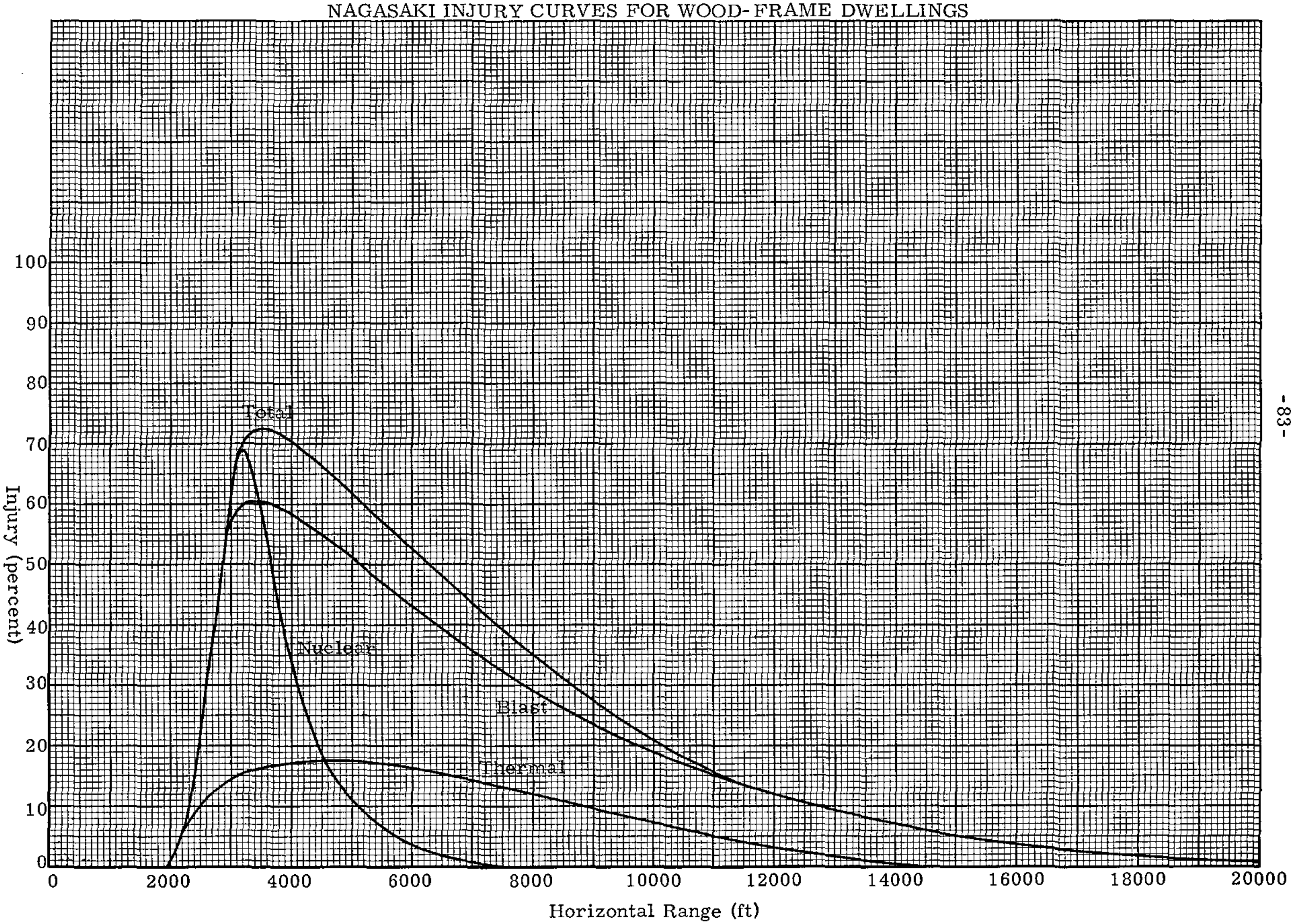
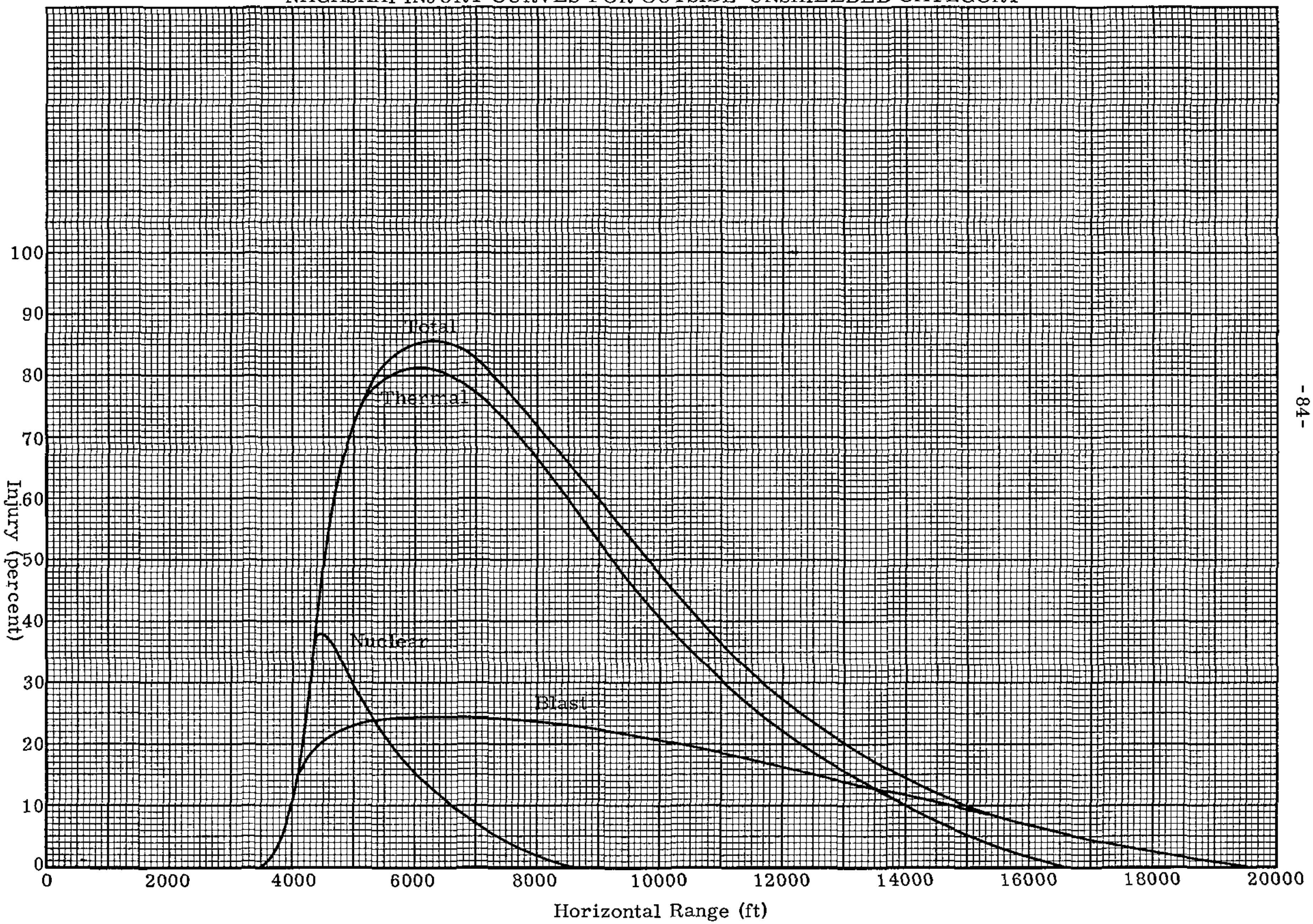


FIG. 58

NAGASAKI INJURY CURVES FOR OUTSIDE-UNSHIELDED CATEGORY



CHAPTER VIII

SUMMARY OF BLAST INJURIES

To assist in determining the medical load resulting from a nuclear detonation, a more detailed history of injuries than that presented in Chapter VII is required. Tables 4 and 5 presented at the end of this chapter provide a breakdown of the various injuries caused by blast for each of the shielding categories previously described for both Hiroshima and Nagasaki.

Six horizontal range intervals are used to present the data. The percentage entered for each range interval is the average over that interval. *These figures represent the distribution of blast injuries* when blast injuries occur. To find the percentage of the persons exposed who received blast injuries for a specific range see the blast injury curves in Chapter VII.

Five principal types of blast injuries are discussed. They are as follows: cuts, lacerations, and punctures; contusions and abrasions; simple fractures; ruptured eardrums; and impairment of consciousness. A dash entered in a table indicates the lack of sufficient data to provide a meaningful conclusion.

The data indicated that when a blast injury was received, it was most likely a cut, laceration, or puncture. For those in buildings or vehicles at the time of the bombing, eighty percent or more of the injuries sustained were of this type. For those outside but shielded by light buildings the percentage of those persons who received cuts, lacerations, and punctures was only slightly less. The most significant change was noted for those people who were outside and unshielded, where the percentage of those persons receiving this type of blast injury decreased substantially as the horizontal range increased.

The second most prevalent type of blast injuries were the contusions and abrasions. Twenty percent or more of those persons who received blast injuries suffered contusions or abrasions regardless of the range. However, those exposed within buildings were better protected from this type of injury. Those people outside and unshielded were the least protected.

The number of compound fractures noted among the survivors was negligible. Less than two percent of those people in wood-frame buildings received this type of injury, which occurred only for ranges less than 6000 feet. Simple fractures were more prevalent. However, these generally occurred less than five percent of the time and only at close-in ranges. At ranges in excess of 9000 feet less than one percent of those persons who received blast injuries had simple fractures. The shielding of the individual had little effect with the exception of light steel-frame industrial buildings. In this case the equipment contained in the building, rather than the building construction itself, appeared to cause the injuries.

Ruptured eardrums were noted among the survivors in most shielding categories. On the average about five percent of the close-in blast injuries sustained by those persons exposed in buildings were of this type. The incidence of injury for those people who were outside and unshielded was somewhat greater. Direct exposure to the overpressure wave appeared to be the principal cause for this increase.

The last category of blast injuries presented is a general one entitled impairment of consciousness. Injuries grouped under this heading include tinnitus, headache, dizziness, vertigo, clouding of consciousness, and loss of consciousness. For horizontal ranges less than 6000 feet approximately twenty-five percent of those persons who received blast injuries experienced one or more of these conditions.

TABLE 4

PERCENT OF BLAST INJURY BY SHIELDING TYPES FOR HIROSHIMA

CUTS, LACERATIONS, AND PUNCTURES

	Horizontal Range (ft)					
Building Type	0-2, 999	3, 000-5, 999	6, 000-8, 999	9, 000-11, 999	12, 000-14, 999	Over 15, 000
Seismic Reinforced Concrete	90	90	84	80	80	80
Nonseismic Reinforced Concrete	85	85	82	80	80	80
Wood-Frame Commercial	80	80	80	80	80	80
Wood-Frame Dwelling	80	80	80	80	80	80
Light Steel-Frame Industrial	80	80	80	80	80	80
Vehicles	80	80	80	80	80	80
Outside Shielded by Light Buildings	72	72	72	72	72	72
Outside Unshielded	70	65	56	50	50	50

TABLE 4 (Continued)

PERCENT OF BLAST INJURY BY SHIELDING TYPES FOR HIROSHIMA

CONTUSIONS AND ABRASIONS

	Horizontal Range (ft)					
Building Type	0-2,999	3,000-5,999	6,000-8,999	9,000-11,999	12,000-14,999	Over 15,000
Seismic Reinforced Concrete	20	20	20	20	20	20
Nonseismic Reinforced Concrete	25	21	20	20	20	20
Wood-Frame Commercial	37	36	32	23	20	20
Wood-Frame Dwelling	32	31	27	21	20	20
Light Steel-Frame Industrial	20	20	20	20	20	20
Vehicles	20	20	20	20	20	20
Outside Shielded by Light Buildings	40	39	33	28	28	28
Outside Unshielded	40	45	49	50	50	50

TABLE 4 (Continued)

PERCENT OF BLAST INJURY BY SHIELDING TYPES FOR HIROSHIMA

SIMPLE FRACTURES

Building Type	Horizontal Range (ft)					
	0-2,999	3,000-5,999	6,000-8,999	9,000-11,999	12,000-14,999	Over 15,000
Seismic Reinforced Concrete	3	3	1	0	0	0
Nonseismic Reinforced Concrete	7	6	3	0	0	0
Wood-Frame Dwelling	3	3	2	0	0	0
Wood-Frame Commercial	5	5	3	0	0	0
Light Steel-Frame Industrial	10	7	2	0	0	0
Vehicles	-	-	-	-	-	-
Outside Shielded by Light Buildings	5	5	3	0	0	0
Outside Unshielded	6	6	4	1	0	0

TABLE 4 (Continued)

PERCENT OF BLAST INJURY BY SHIELDING TYPES FOR HIROSHIMA

RUPTURED EARDRUMS

Building Type	Horizontal Range (ft) 0-2,999	3,000-5,999	6,000-8,999	9,000-11,999	12,000-14,999	Over 15,000
Seismic Reinforced Concrete	10	5	0	0	0	0
Nonseismic Reinforced Concrete	-	-	-	-	-	-
Wood-Frame Commercial	9	5	1	0	0	0
Wood-Frame Dwelling	2	1	0	0	0	0
Light Steel-Frame Industrial	-	-	-	-	-	-
Vehicles	-	-	-	-	-	-
Outside Shielded by Light Buildings	3	2	1	0	0	0
Outside Unshielded	9	6	1	0	0	0

TABLE 4 (Continued)

PERCENT OF BLAST INJURY BY SHIELDING TYPES FOR HIROSHIMA

IMPAIRMENT OF CONSCIOUSNESS

	Horizontal Range (ft)					
Building Type	0-2,999	3,000-5,999	6,000-8,999	9,000-11,999	12,000-14,999	Over 15,000
Seismic Reinforced Concrete	25	18	6	1	0	0
Nonseismic Reinforced Concrete	22	21	14	4	1	0
Wood-Frame Commercial	26	24	20	11	2	0
Wood-Frame Dwelling	12	9	6	2	0	0
Light Steel-Frame Industrial	24	20	8	1	0	0
Vehicles	-	-	-	-	-	-
Outside Shielded by Light Buildings	25	20	6	1	0	0
Outside Unshielded	29	27	20	3	0	0

TABLE 5

PERCENT OF BLAST INJURY BY SHIELDING TYPES FOR NAGASAKI

CUTS, LACERATIONS, AND PUNCTURES

	Horizontal Range (ft)					
Building Type	0-2,999	3,000-5,999	6,000-8,999	9,000-11,999	12,000-14,999	Over 15,000
Seismic Reinforced Concrete	90	90	85	81	80	80
Nonseismic Reinforced Concrete	85	85	82	80	80	80
Wood-Frame Commercial	80	80	80	80	80	80
Wood-Frame Dwelling	80	80	80	80	80	80
Light Steel-Frame Industrial	80	80	80	80	80	80
Outside Shielded by Light Buildings	-	-	-	-	-	-
Outside Unshielded	65	63	56	50	50	50
Underground Shelters	50	50	50	50	50	50

TABLE 5 (Continued)

PERCENT OF BLAST INJURY BY SHIELDING TYPES FOR NAGASAKI

CONTUSIONS AND ABRASIONS

	Horizontal Range (ft)					
Building Type	0-2, 999	3, 000-5, 999	6, 000-8, 999	9, 000-11, 999	12, 000-14, 999	Over 15, 000
Seismic Reinforced Concrete	24	22	20	20	20	20
Nonseismic Reinforced Concrete	30	27	24	20	20	20
Wood-Frame Commercial	40	39	34	24	20	20
Wood-Frame Dwelling	35	31	23	20	20	20
Light Steel-Frame Industrial	20	20	20	20	20	20
Outside Shielded by Light Buildings	-	-	-	-	-	-
Outside Unshielded	40	45	49	50	50	50
Underground Shelters	50	50	50	50	50	50

TABLE 5 (Continued)

PERCENT OF BLAST INJURY BY SHIELDING TYPES FOR NAGASAKI

SIMPLE FRACTURES

	Horizontal Range (ft)					
Building Type	0-2,999	3,000-5,999	6,000-8,999	9,000-11,999	12,000-14,999	Over 15,000
Seismic Reinforced Concrete	6	5	1	0	0	0
Nonseismic Reinforced Concrete	5	5	2	0	0	0
Wood-Frame Commercial	5	5	3	1	0	0
Wood-Frame Dwelling	4	4	3	1	0	0
Light Steel-Frame Industrial	6	4	1	0	0	0
Outside Shielded by Light Buildings	-	-	-	-	-	-
Outside Unshielded	-	-	-	-	-	-
Underground Shelters	-	-	-	-	-	-

TABLE 5 (Continued)

PERCENT OF BLAST INJURY BY SHIELDING TYPES FOR NAGASAKI

RUPTURED EARDRUMS

Building Type	Horizontal Range (ft)					
	0-2, 999	3, 000-5, 999	6, 000-8, 999	9, 000-11, 999	12, 000-14, 999	Over 15, 000
Seismic Reinforced Concrete	7	3	0	0	0	0
Nonseismic Reinforced Concrete	7	6	5	1	0	0
Wood-Frame Commercial	5	3	1	0	0	0
Wood-Frame Dwelling	-	-	-	-	-	-
Light Steel-Frame Industrial	7	5	1	0	0	0
Outside Shielded by Light Buildings	-	-	-	-	-	-
Outside Unshielded	15	10	4	1	0	0
Underground Shelters	-	-	-	-	-	-

TABLE 5 (Continued)

PERCENT OF BLAST INJURY BY SHIELDING TYPES FOR NAGASAKI

IMPAIRMENT OF CONSCIOUSNESS

Building Type	Horizontal Range (ft)					
	0-2,999	3,000-5,999	6,000-8,999	9,000-11,999	12,000-14,999	Over 15,000
Seismic Reinforced Concrete	16	10	2	0	0	0
Nonseismic Reinforced Concrete	30	30	27	12	2	0
Wood-Frame Commercial	26	25	18	6	1	0
Wood-Frame Dwelling	15	13	10	3	0	0
Light Steel-Frame Industrial	25	21	8	1	0	0
Outside Shielded by Light Buildings	-	-	-	-	-	-
Outside Unshielded	25	25	23	9	0	0
Underground Shelters	-	-	-	-	-	-

CHAPTER IX

OTHER POST-ATTACK DATA

A. KILLED IMMEDIATELY

The data base for those killed immediately is different from that utilized to define the other mortality and injury curves. The number of cases at any given range is based on the number of people reported to be in a group by a known member of that group. Similarly, the number of persons killed immediately in a group is based upon the report of one or more members of the group. This data base is somewhat broader than that used for the other mortality and injury curves as there are more cases reported. However, due to difficulties involved with multiple reportings within a single group and the accuracy of individual reports about other persons in the group, this data base is not as accurate as the one used for the other mortality and injury curves. Obviously, to define a curve for those killed immediately one must employ a data base of this nature since the other data base is not necessarily a complete sample of any given group (especially of those killed immediately in the group).

There are virtually no data within a horizontal range of 1000 feet from the hypocenter. The curves have been extended into these regions of high mortality although reliable data do not exist for these areas. In an effort to minimize the extrapolation of these curves, they are not extended beyond the 50-percent mortality point. The only three categories in both cities in which there were sufficient data to define curves were seismic reinforced-concrete buildings (SRC), wood-frame commercial buildings (WFC), and wood-frame dwellings (WFD). These curves are presented in Figs. 59 and 60.

1. Results for Hiroshima

The curve for seismic reinforced-concrete buildings is somewhat lower than the corresponding total mortality curve for horizontal ranges near the hypocenter. However, at the longer horizontal ranges the two curves approach each other in value. These facts indicate that most of the people killed in seismic structures die immediately, especially at the longer ranges.

For wood-frame commercial buildings and wood-frame dwellings the difference between the total mortalities and those killed immediately is greater at horizontal ranges near the hypocenter than it was for the

FIG. 59

KILLED-IMMEDIATELY CURVES FOR HIROSHIMA

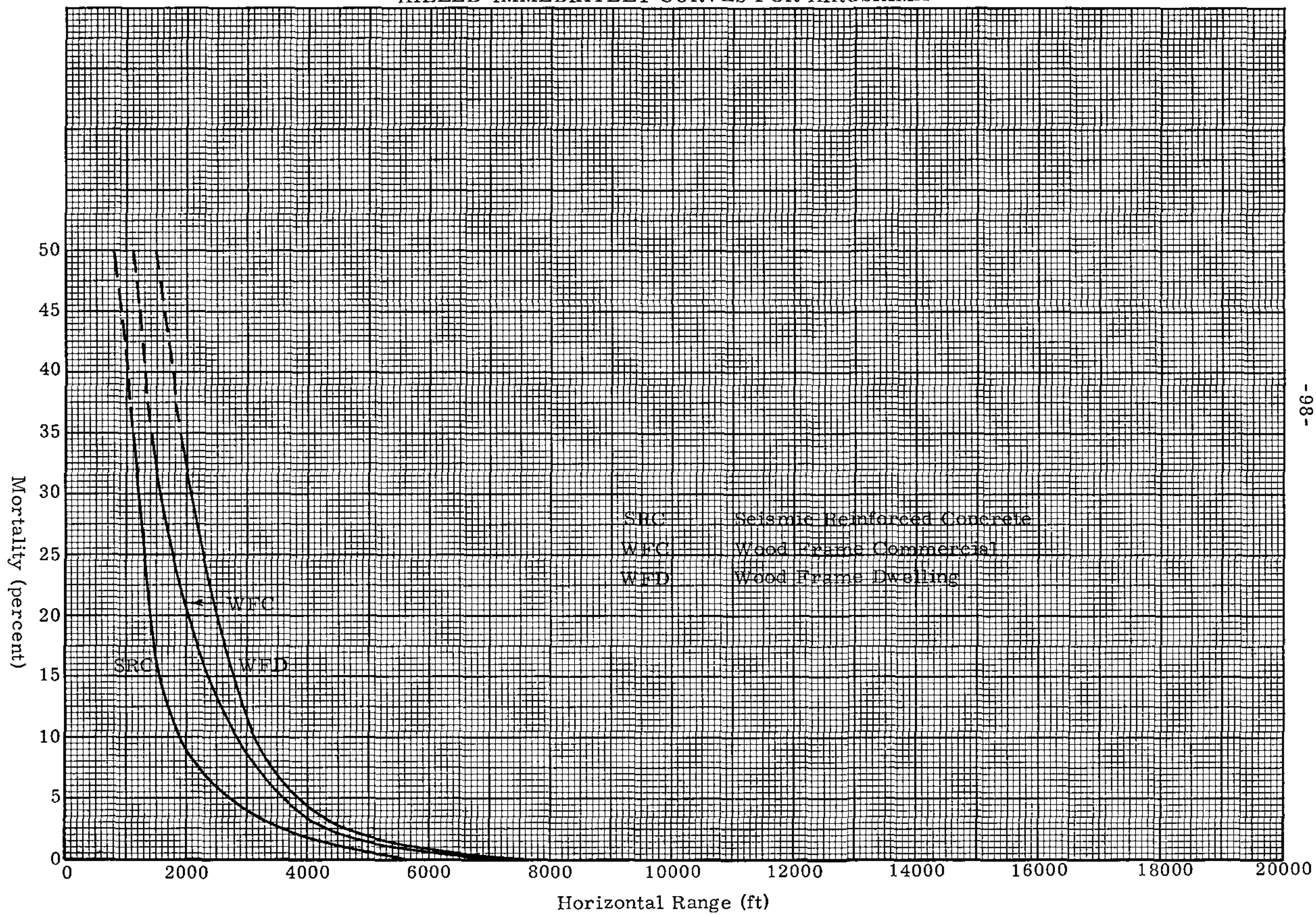
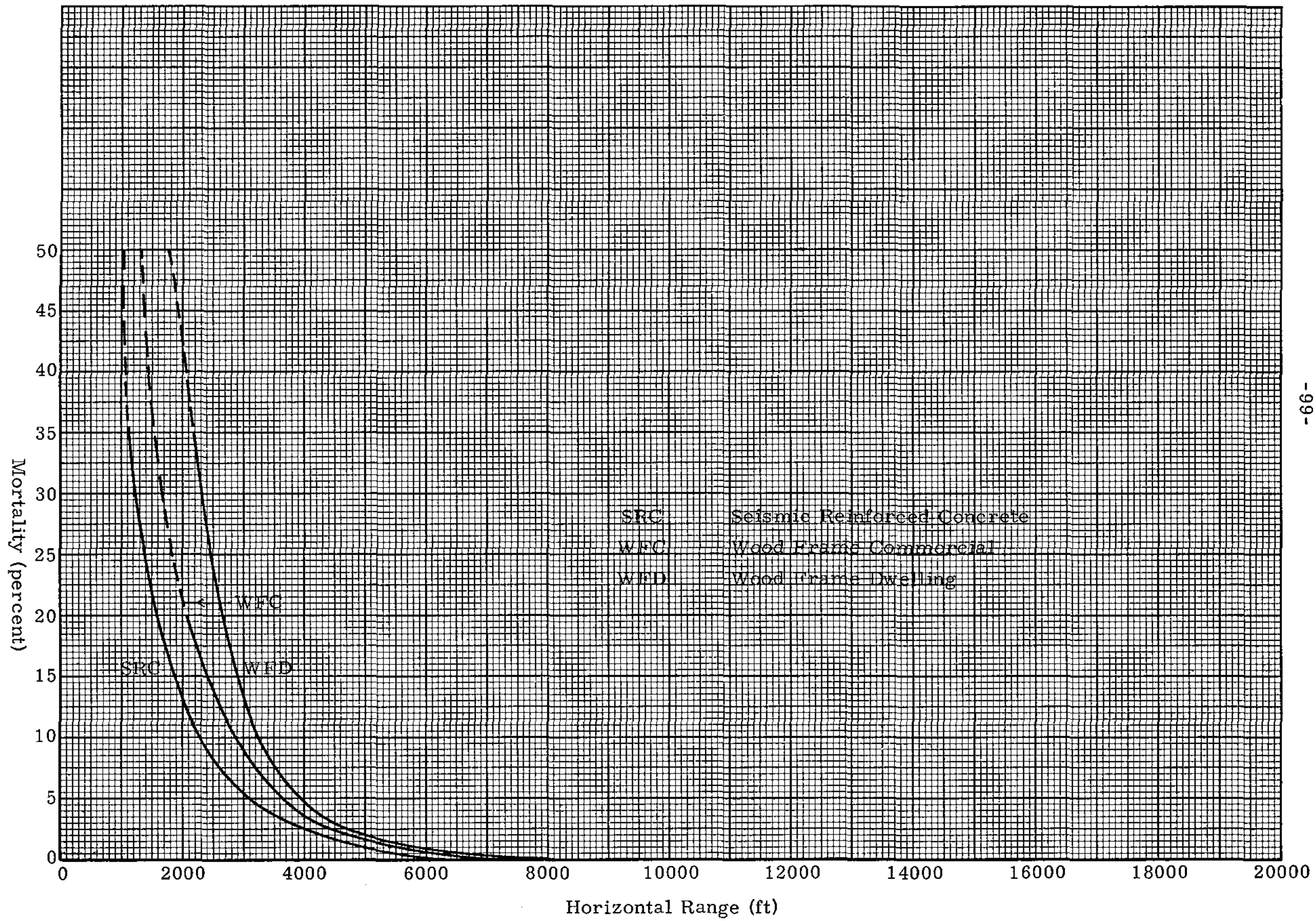


FIG. 60

KILLED-IMMEDIATELY CURVES FOR NAGASAKI



seismic structures. However, at the longer ranges the total mortalities and those killed immediately again approach each other in value.

Since the curves for Hiroshima are based on considerably more data than those for Nagasaki, the former curves are much more reliable. The most reliable curve for Hiroshima is that for wood-frame dwellings.

2. Results for Nagasaki

The data for seismic reinforced-concrete buildings indicate that there is a somewhat greater spread at the close-in ranges between the total mortalities and those killed immediately than was the case for Hiroshima. However, at the longer ranges the same converging is apparent. The curves for wood-frame commercial buildings and wood-frame dwellings appear to behave about the same as they did in Hiroshima.

B. RESCUED BY OTHERS

The data base for those rescued by others is the same as that utilized for those killed immediately. Hence, the discussion in the previous section concerning the reliability of the data is applicable here.

In Hiroshima there were sufficient reliable data on those rescued by others for seismic reinforced-concrete buildings, wood-frame commercial buildings, and wood-frame dwellings. However, in Nagasaki sufficient data existed only for wood-frame commercial buildings and wood-frame dwellings. Because of the limited amount and nature of these data, the information is presented in Table 6 rather than in graphical form. The percentages given are based on the total population exposed in each range interval.

From the data presented for both cities it appears that little effort was exerted by the fleeing populace to rescue persons other than close friends or family. Even in these instances, rescue efforts were somewhat sporadic and limited only to those who could be extricated in a short time with limited manpower.

Better data were available from Hiroshima than from Nagasaki. Again, the most reliable category was that for wood-frame dwellings. The data were somewhat more scarce in Nagasaki. This result was due in part to the fact that no mass fires developed, which allowed more time for self-rescue. Also, the methods employed by early investigators for gathering these data were not as detailed as for Hiroshima.

TABLE 6

PERCENT RESCUED BY OTHERS*

Shielding Categories	Horizontal Range (ft)				
	0-2,999	3,000-5,999	6,000-8,999	9,000-11,999	Over 12,000
Hiroshima					
Seismic Reinforced Concrete	2	1	0	0	0
Wood-Frame Commercial	3	2	1	0	0
Wood-Frame Dwelling	5	5	4	2	0
Nagasaki					
Wood-Frame Commercial	1	1	1	0	0
Wood-Frame Dwelling	2	2	2	1	0

*These percentages are based on the total population.

C. SURVIVAL IN THE FIRE

Large fires developed immediately after the bomb was detonated in Hiroshima. Within thirty minutes these fires merged into a mass fire or firestorm. Little data with respect to survival in firestorms have been available in the past. However, several entries were provided in the coding format to gleen information from this firestorm.

From the more than 24, 000 case histories available from Hiroshima, a total of 755 were for persons who remained in the area during the firestorm. This area was defined in the army map series AMS-L902 as that area which was totally destroyed by fire. Those people near the outer edges may or may not have been in the actual firestorm. Further study to position these people with respect to the firestorm is needed before valid assumptions can be made regarding survival.

The distribution of those people who survived listed by shelter type is of interest. A total of 39 persons survived the fire sheltered by buildings. These buildings contained little combustible material. Another 126 persons survived the fire sheltered by water. In most cases this shelter referred to one of the many rivers, but in a few cases it referred to large cisterns used for collecting rainwater. Open areas such as fire breaks and large playgrounds or parade areas provided shelter for another 107 persons. Caves, tunnels, or trenches sheltered 23 more. The remaining 460 people stated that they had remained in the fire area during the fire, but no reference was given regarding the type or location of their shelter.

D. TIME TO DEATH

The information on time to death is derived from the same data base as the mortality curves; therefore, the same difficulties concerning the lack of data are present. The further subdivision of the mortality data by time and range only decrease the statistical reliability. Thus, it is not surprising that there are insufficient data to define meaningful curves for many of the shielding categories. For several categories for which some data exist, curves were drawn for various ranges. No significant dependence upon range was evident (possibly because of statistical difficulties). However, for ranges closer to the hypocenter there appears to be some plateauing of the curves from about two to ten days for seismic and nonseismic reinforced-concrete buildings and from about two to about fifteen to twenty days for all the remaining categories except outside-unshielded, which did not exhibit this effect. This plateauing effect was also not evident at the longer ranges for any of the shielding categories. It would seem that this result is further evidence of the dominant effect of the initial nuclear radiation in the deaths of thermally-shielded people in both cities.

These time-to-death curves are based not only on the actual data points for a given curve but also on other applicable data such as the approximate fraction of the total population killed on the first day as derived from current and earlier sources on the Japanese experience and on the overall statistics involved. The best estimates for all of the initial (first day) mortality points for all of the various shielding categories lie between 40 and 70 percent in both Hiroshima and Nagasaki. These curves are shown in Figs. 61 and 62 with the range variable eliminated.

It appears that the most reliable curve is that for wood-frame dwellings in Hiroshima. There are more cases for this category in Hiroshima than in all of the other categories combined in both cities.

The shielding categories for which there were sufficient data to define curves in Hiroshima were seismic reinforced-concrete buildings (SRC) (125 case histories), wood-frame commercial buildings (WFC) (39 case histories), wood-frame dwellings (WFD) (909 case histories), outside-shielded by light buildings (OS) (46 case histories), and outside-unshielded (OU) (148 case histories). In general, there were more data available from Hiroshima.

The shielding categories for which sufficient data existed to define curves in Nagasaki were seismic reinforced-concrete buildings (SRC) (167 case histories), nonseismic reinforced-concrete buildings (NRC) (22 case histories), wood-frame commercial buildings (WFC) (128 case histories), wood-frame dwellings (WFD) (31 case histories), outside-unshielded category (OU) (55 case histories), and underground shelters (US) (13 case histories).

FIG. 61

CUMULATIVE PERCENT MORTALITY VERSUS TIME TO DEATH FOR HIROSHIMA

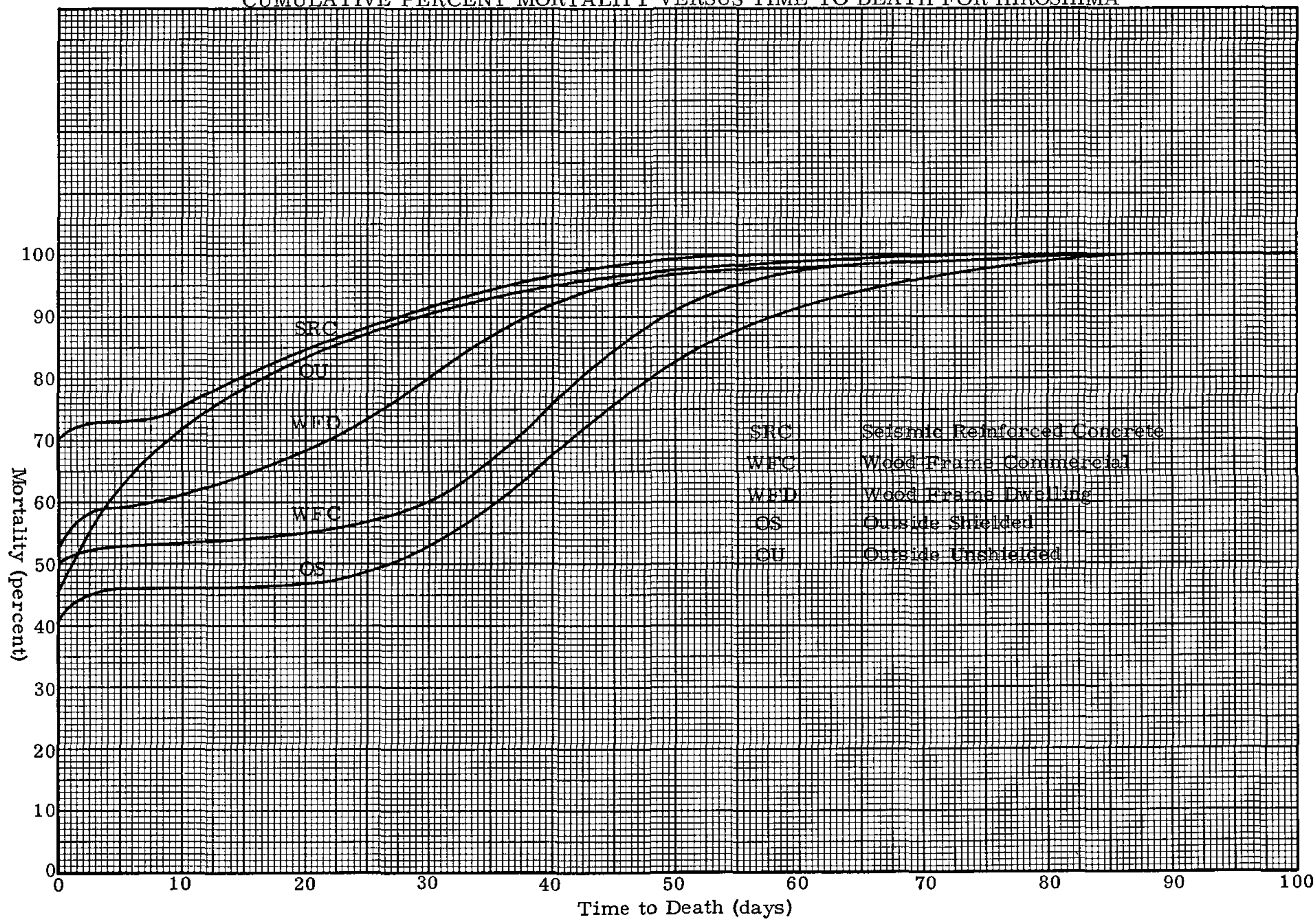
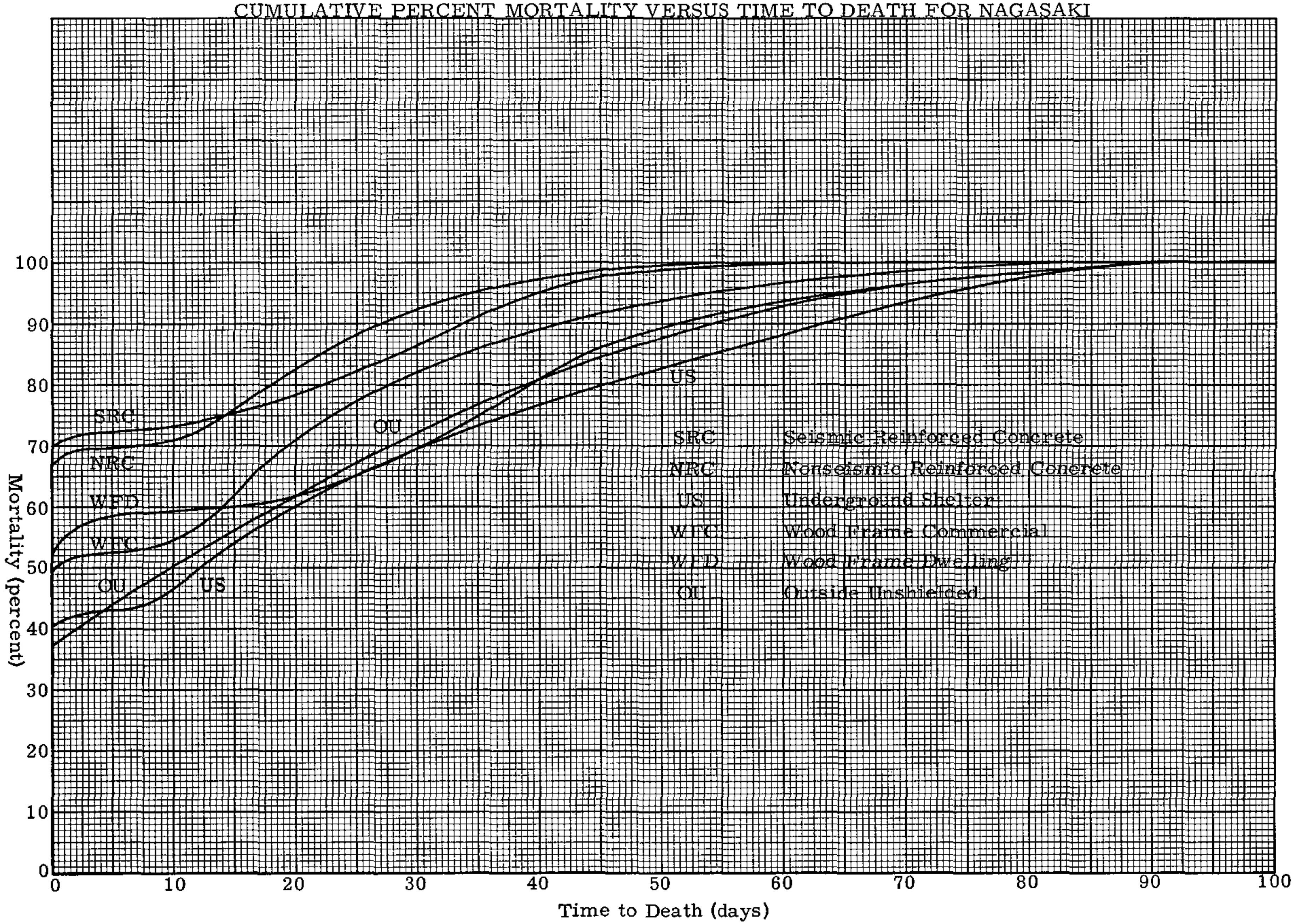


FIG. 62

CUMULATIVE PERCENT MORTALITY VERSUS TIME TO DEATH FOR NAGASAKI



CHAPTER X

ACCURACY ESTIMATES OF THE JAPANESE DATA

In order to give the reader some quantitative feel for the accuracy of the data presented in this report, estimates were made of the errors associated with each curve and table which were based on the Japanese data. A strict statistical analysis was not made since many non-quantitative factors could not be properly considered. The error in a given curve was estimated by weighting several factors such as the pertinent weapons-effects data, character of similar curves for similar shielding categories, general nature of the sample, number of persons represented by each data point, and, of course, the statistical spread of the data. Since most of the data came from survivor interviews (which included information on the dead in their group), the data are quite sparse near the hypocenter. In addition, some bias of the data is undoubtedly present in this area because of the lack of information on groups of people in which everyone was killed immediately. However, an attempt was made to remove this bias by utilizing other information such as the weapons effects data. It is estimated that the true mean curve has a 70- to 90-percent chance of lying within the boundaries defined by the upper and lower error curves.

Quantitative estimates of the errors applicable to the curves in this report as based on the Japanese data are given in Table 7. It was felt that the most adequate representation of the error as a function of the curve's given value could be achieved by the use of an error factor. The error factor is applied to each point on a curve to give a value (in units of percent) which is both added and subtracted from the point on the curve to indicate the range of values within which the curve is thought to lie. The use of the factor results in an error deviation which varies with the value of the curve. However, in no case should this calculated error deviation lie below the minimum or exceed the maximum deviations as given by Table 7. (Note that these deviations, although given in units of percent, are the minimum or maximum values to be added or subtracted from a point on the curve; they are not factors.) If error curves are drawn for a particular curve, one should smooth the given minimum and maximum error deviations into the deviations determined by the error factor. In no case should the application of the error deviation to the value given by the curve result in an absolute percentage value less than 0 or greater than 100. In general, the maximum error deviation is applicable to the portions of the curves near the hypocenter, while the minimum error deviation is applicable to the portions of the curves at the longer ranges.

Certain specific procedures should be followed when the error curves reach 0 or 100 percent. The upper error curve will reach a proper intercept with 100 percent, and the lower error curve should be drawn to intercept 100

TABLE 7

ERROR PERCENTAGES APPLICABLE TO CURVES[≠]

Figure Number	Curve Identification	Error Factor	Minimum Error Deviation (%)[#]	Maximum Error Deviation (%)[#]
27	3rd Degree	0.20	3	15
27	2nd Degree	0.20	5	10
28	3rd Degree*	0.30	4	25
28	2nd Degree	0.25	5	15
29	3rd Degree	0.10	3	-
29	2nd Degree	0.10	2	-
34	SRC-B	0.30	3	-
34	SRC-L	0.25	3	-
34	SRC-M	0.25	3	20
34	SRC-U	0.30	4	20
34	SRC	0.20	3	15
34	NRC*	0.40	5	25
34	LSF	0.30	3	20
34	WFC	0.20	3	20
34	WFD	0.10	2	-
34	V	0.40	4	25
34	OS	0.25	3	20
34	OU	0.20	3	-
35	SRC-L	0.30	5	20
35	SRC-M	0.40	5	25
35	SRC-U	0.40	5	25
35	SRC	0.30	5	20
35	NRC	0.35	4	25
35	LSF	0.30	4	20
35	WFC	0.30	3	20
35	WFD	0.20	3	15
35	US	0.40	4	-
35	OS	0.40	5	25
35	OU	0.40	5	25

≠ Values are presented only for those curves based on the Japanese data.

These values are to be added or subtracted from a point on the curve; they are not factors.

* Estimated curves.

TABLE 7 (Continued)

ERROR PERCENTAGES APPLICABLE TO CURVES

Figure Number	Curve Identification	Error Factor	Minimum Error Deviation (%)	Maximum Error Deviation (%)
36	Total	0.15	4	15
36	Nuclear*	0.30	5	15
36	Thermal*	-	4	4
36	Blast	0.20	4	15
37	Total	0.20	4	15
37	Nuclear	0.25	5	15
37	Thermal*	-	5	5
37	Blast	0.20	4	15
38	Total	0.20	4	20
38	Nuclear	0.25	5	20
38	Thermal*	0.70	5	10
38	Blast	0.20	4	20
39	Total	0.25	5	25
39	Nuclear	0.40	5	25
39	Thermal*	0.60	5	10
39	Blast	0.25	5	25
40	Total	0.15	4	15
40	Nuclear	0.20	5	15
40	Thermal	0.40	5	10
40	Blast	0.20	4	15
41	Total*	0.30	6	25
41	Nuclear*	0.30	6	20
41	Thermal*	0.40	6	10
41	Blast*	0.30	6	25
42	Total	0.20	5	15
42	Nuclear*	0.30	6	20
42	Thermal*	0.30	5	10
42	Blast	0.20	5	15

*Estimated curves.

TABLE 7 (Continued)

ERROR PERCENTAGES APPLICABLE TO CURVES

Figure Number	Curve Identification	Error Factor	Minimum Error Deviation (%)	Maximum Error Deviation (%)
43	Total	0.30	5	25
43	Nuclear	0.30	6	25
43	Thermal	0.40	6	20
43	Blast	0.30	5	15
44	Total	0.20	4	15
44	Nuclear	0.20	5	15
44	Thermal	0.60	5	10
44	Blast	0.20	4	10
45	Total	0.20	4	15
45	Nuclear	0.20	6	15
45	Thermal	0.50	5	10
45	Blast	0.15	4	10
46	Total	0.15	3	10
46	Nuclear	0.20	4	10
46	Thermal	-	4	4
46	Blast	0.15	3	10
47	Total	0.15	4	15
47	Nuclear	0.40	5	20
47	Thermal	0.15	5	15
47	Blast	0.25	4	5
48	Total*	0.40	5	-
48	Nuclear*	0.60	5	-
48	Thermal*	-	5	5
48	Blast*	0.50	5	-
49	Total*	0.25	5	20
49	Nuclear*	0.25	6	20
49	Thermal	0.60	6	10
49	Blast	0.25	5	20

*Estimated curves.

TABLE 7 (Continued)

ERROR PERCENTAGES APPLICABLE TO CURVES

Figure Number	Curve Identification	Error Factor	Minimum Error Deviation (%)	Maximum Error Deviation (%)
50	Total	0.25	5	20
50	Nuclear	0.30	6	20
50	Thermal*	-	5	5
50	Blast	0.25	5	20
51	Total*	0.25	6	25
51	Nuclear*	0.35	6	25
51	Thermal*	-	6	6
51	Blast*	0.25	6	25
52	Total	0.20	5	20
52	Nuclear	0.30	5	20
52	Thermal*	-	5	5
52	Blast	0.20	5	20
53	Total	0.20	5	20
53	Nuclear*	0.30	6	20
53	Thermal*	0.40	6	10
53	Blast	0.25	5	20
54	Total	0.25	5	20
54	Nuclear	0.30	5	20
54	Thermal*	0.50	6	10
54	Blast	0.25	5	20
55	Total	0.30	6	25
55	Nuclear*	0.35	6	25
55	Thermal*	0.50	6	10
55	Blast*	0.35	6	25
56	Total	0.20	4	15
56	Nuclear	0.25	5	15
56	Thermal	-	5	5
56	Blast	0.20	4	15

*Estimated curves.

TABLE 7 (Continued)

ERROR PERCENTAGES APPLICABLE TO CURVES

Figure Number	Curve Identification	Error Factor	Minimum Error Deviation (%)	Maximum Error Deviation (%)
57	Total	0.15	3	10
57	Nuclear	0.15	4	10
57	Thermal	-	5	5
57	Blast	0.20	4	10
58	Total	0.15	5	15
58	Nuclear	0.30	6	10
58	Thermal	0.20	5	15
58	Blast	0.40	4	10
59	SRC	0.20	4	-
59	WFC	0.20	3	-
59	WFD	0.15	2	-
60	SRC	0.30	4	-
60	WFC	0.30	3	-
60	WFD	0.20	3	-
61**	SRC	0.30	3	-
61	WFC	0.15	3	-
61	WFD	0.10	2	-
61	OS	0.30	3	-
61	OU	0.20	3	-
62**	SRC	0.40	3	-
62	NRC	0.50	3	-
62	WFC	0.40	3	-
62	WFD	0.40	2	-
62	OU	0.30	3	-
62	US	0.40	3	-

**See the text for an explanation of the use of the error factors for Figs. 61 and 62.

percent at the same horizontal increment from the mean curve. Similarly, the lower error curve will determine the horizontal increment from the mean curve for the 0-percent intercept. The error curves will thus be equally spaced from the mean curve at the 0- and 100-percent intercept points.

For the injury curves the maximum error deviation should be used everywhere to the left of the peak value and should blend in with the error computed by means of the error factor to the right of the peak value. It should be noted that in some instances a fixed error deviation is applicable to an entire curve. In such cases Table 7 will have no entry in the column headed error factor.

The error deviation for the time-to-death curves is computed in a slightly different manner from the rest of the curves. The error deviation is found by multiplying the error factor times (100 minus the percent mortality). However, the minimum and maximum error deviations are utilized in the same manner as described previously.

Quantitative estimates of the errors applicable to the <u>tables</u> in this report as based on the Japanese data are given in Table 8. In this instance the error deviation is constant. The value (given in units of percent) must be added or subtracted from the tabulated value to indicate the range within which the value may lie.

As examples of the kind of data from which the casualty curves were developed, two curves were selected from the figures in the text to represent the extremes in accuracy or availability of the data. The mortality curve for wood-frame dwellings in Hiroshima (shown in Fig. 63) was selected as representative of good data, and the injury curve for light steel-frame industrial structures in Hiroshima (shown in Fig. 64) was selected as representative of poor data. The coding system used to indicate the number of persons associated with each data point is given on the figures. Of course, other considerations such as weapons effects information, constraints of associated casualty curves, and similar curves for similar shielding categories helped to determine curves for which little data were available.

Data points are not shown for all of the curves since only one curve could then be presented per figure. Otherwise, the points could not easily be associated with the proper curve. Even with one curve per figure the points have to be coded to indicate the number of people and thus one measure of the reliability associated with each point. If only one curve were presented per figure, the report would be too voluminous and would not allow the important advantage of relative comparisons among similar curves which now exists. It was felt that the accuracy or reliability of the curves could be presented more concisely by the error estimates given in Tables 7 and 8.

TABLE 8

ERROR PERCENTAGES APPLICABLE TO TABLES*

Table Number	Table Identification	Error Deviation (%)#
4	SRC - Cuts, Lacerations, and Punctures	10
4	NRC - Cuts, Lacerations, and Punctures	15
4	WFC - Cuts, Lacerations, and Punctures	10
4	WFD - Cuts, Lacerations, and Punctures	5
4	LSF - Cuts, Lacerations, and Punctures	15
4	V - Cuts, Lacerations, and Punctures	15
4	OS - Cuts, Lacerations, and Punctures	10
4	OU - Cuts, Lacerations, and Punctures	15
4	SRC - Contusions and Abrasions	10
4	NRC - Contusions and Abrasions	15
4	WFC - Contusions and Abrasions	10
4	WFD - Contusions and Abrasions	5
4	LSF - Contusions and Abrasions	15
4	V - Contusions and Abrasions	15
4	OS - Contusions and Abrasions	10
4	OU - Contusions and Abrasions	15
4	SRC - Simple Fractures	5
4	NRC - Simple Fractures	10
4	WFC - Simple Fractures	5
4	WFD - Simple Fractures	2
4	LSF - Simple Fractures	10
4	OS - Simple Fractures	5
4	OU - Simple Fractures	5
4	SRC - Ruptured Eardrums	10
4	WFC - Ruptured Eardrums	5
4	WFD - Ruptured Eardrums	2
4	OS - Ruptured Eardrums	3
4	OU - Ruptured Eardrums	10

---

*Values are presented only for those tables based on the Japanese data.

#These deviations are to be added or subtracted from the tabulated value; they are not factors.

TABLE 8 (Continued)

ERROR PERCENTAGES APPLICABLE TO TABLES

Table Number	Table Identification	Error Deviation (%)
4	SRC - Impairment of Consciousness	10
4	NRC - Impairment of Consciousness	10
4	WFC - Impairment of Consciousness	15
4	WFD - Impairment of Consciousness	5
4	LSF - Impairment of Consciousness	15
4	OS - Impairment of Consciousness	15
4	OU - Impairment of Consciousness	15
5	SRC - Cuts, Lacerations, and Punctures	15
5	NRC - Cuts, Lacerations, and Punctures	10
5	WFC - Cuts, Lacerations, and Punctures	15
5	WFD - Cuts, Lacerations, and Punctures	10
5	LSF - Cuts, Lacerations, and Punctures	15
5	OU - Cuts, Lacerations, and Punctures	20
5	US - Cuts, Lacerations, and Punctures	30
5	SRC - Contusions and Abrasions	10
5	NRC - Contusions and Abrasions	10
5	WFC - Contusions and Abrasions	10
5	WFD - Contusions and Abrasions	5
5	LSF - Contusions and Abrasions	15
5	OU - Contusions and Abrasions	20
5	US - Contusions and Abrasions	30
5	SRC - Simple Fractures	5
5	NRC - Simple Fractures	5
5	WFC - Simple Fractures	5
5	WFD - Simple Fractures	3
5	LSF - Simple Fractures	5
5	SRC - Ruptured Eardrums	5
5	NRC - Ruptured Eardrums	5
5	WFC - Ruptured Eardrums	5
5	LSF - Ruptured Eardrums	5
5	OU - Ruptured Eardrums	10

TABLE 8 (Continued)

ERROR PERCENTAGES APPLICABLE TO TABLES

Table Number	Table Identification	Error Deviation (%)
5	SRC - Impairment of Consciousness	15
5	NRC - Impairment of Consciousness	10
5	WFC - Impairment of Consciousness	15
5	WFD - Impairment of Consciousness	10
5	LSF - Impairment of Consciousness	15
5	OU - Impairment of Consciousness	15
6	SRC - Hiroshima	2
6	WFC - Hiroshima	2
6	WFD - Hiroshima	2
6	WFC - Nagasaki	2
6	WFD - Nagasaki	2

FIG. 63

HIROSHIMA TOTAL MORTALITY CURVE WITH DATA FOR WOOD-FRAME DWELLINGS

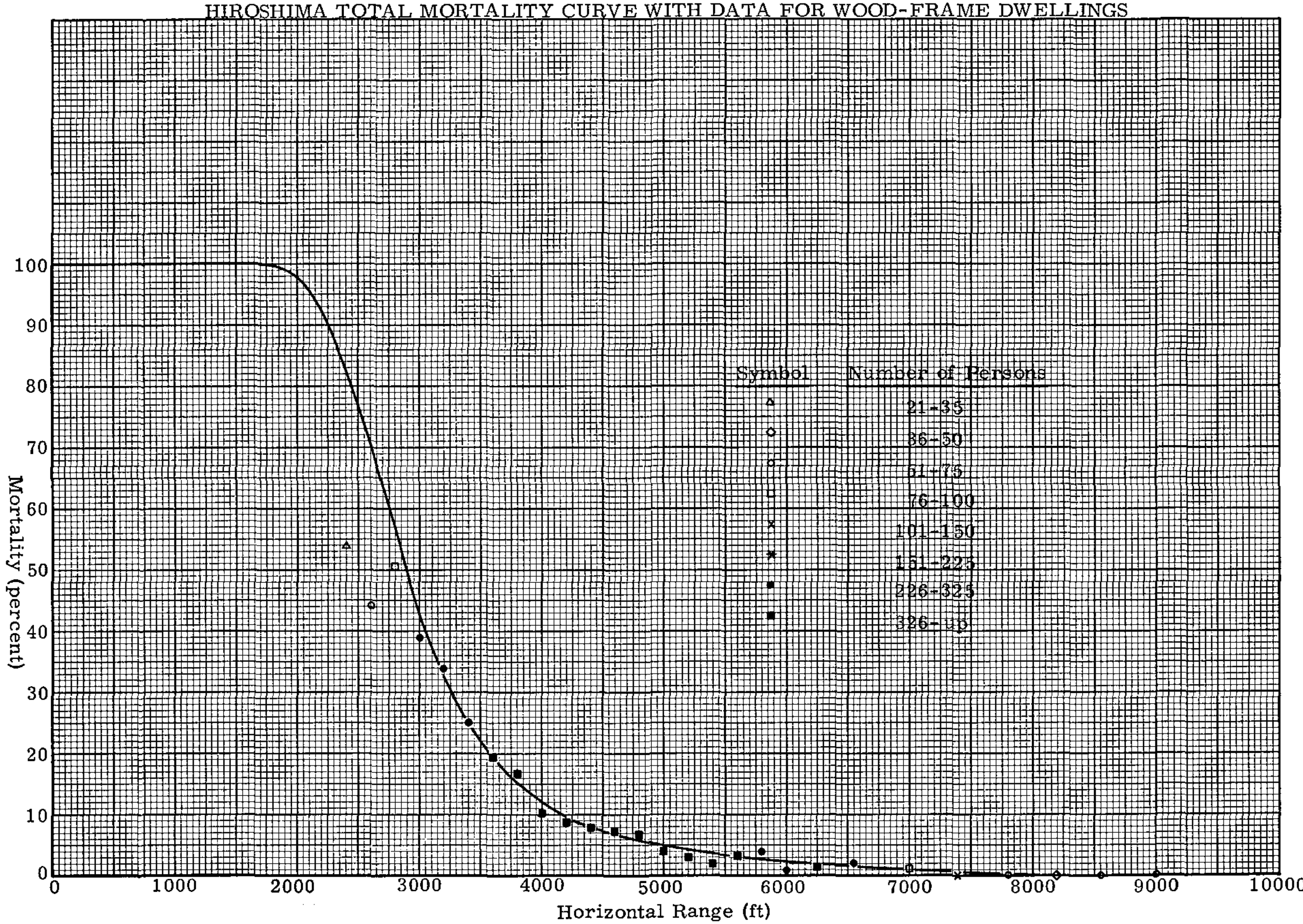
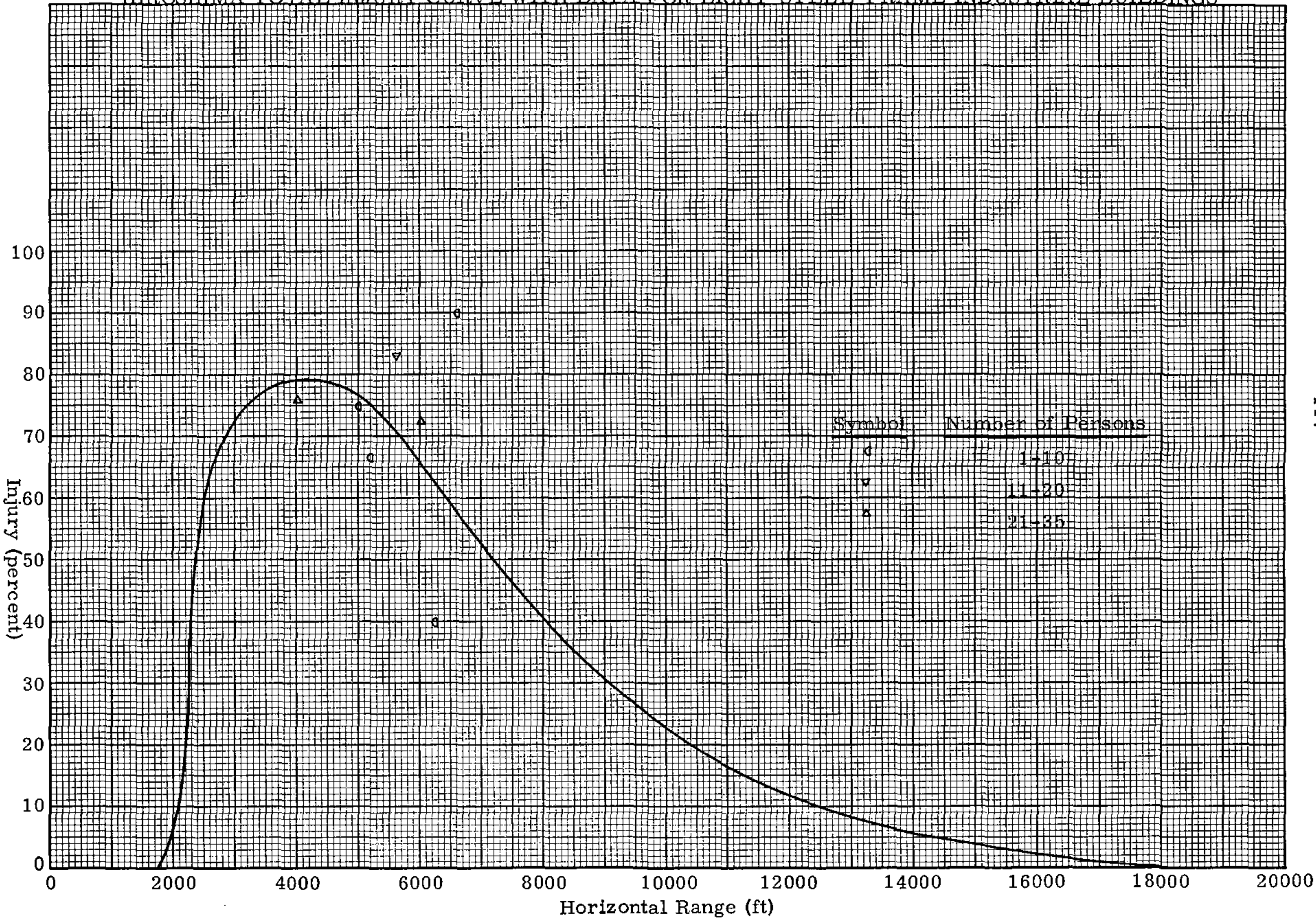


FIG. 64

HIROSHIMA TOTAL INJURY CURVE WITH DATA FOR LIGHT STEEL-FRAME INDUSTRIAL BUILDINGS



LIST OF REFERENCES

1. The Effects of the Atomic Bomb on Hiroshima, Japan, Report No. 92 (Vols. I-III), U. S. Strategic Bombing Survey, Physical Damage Division; May, 1947.

2. Effects of the Atomic Bomb on Nagasaki, Japan, Report No. 93 (Vols. I-III), U. S. Strategic Bombing Survey, Physical Damage Division; June, 1947.

3. Ashley W. Oughterson, et al., Medical Effects of Atomic Bombs, NP-3036 to NP-3041 (Vols. I-VI), Army Institute of Pathology; 1951.

4. L. W. Davis, D. L. Summers, and A. R. Durand, Phenomenology of Blast, Thermal, and Initial Neutron Radiation Pertinent to Personnel Casualties, DC-FR-1012, The Dikewood Corporation; February 10, 1961. (Classified)

5. Capabilities of Atomic Weapons, TM23-200, Armed Forces Special Weapons Project; November, 1957. (Classified)

6. Samuel Glasstone, Editor, The Effects of Nuclear Weapons, U. S. Atomic Energy Commission; 1957 and 1962.

7. Clayton S. White, et al., Comparative Nuclear Effects of Biomedical Interest, CEX-58.8, The Lovelace Foundation; January 12, 1961.

8. J. A. Auxier, et al., "Free-Field Radiation-Dose Distributions from the Hiroshima and Nagasaki Bombings", Health Physics Journal, Vol. 12, p. 425; March, 1966.

9. J. F. Moulton, Jr., Nuclear Weapons Blast Phenomena, DASA-1200, U. S. Naval Ordnance Laboratory; March, 1960. (Classified)

10. L. Wayne Davis, Donald L. Summers, Milton E. Jenkins, Francis J. Wall, and William L. Baker, Prediction of Urban Casualties from the Immediate Effects of a Nuclear Attack, DC-FR-1028, The Dikewood Corporation; April, 1963. (Classified)

11. L. Wayne Davis, Francis J. Wall, and Donald L. Summers, Development of "Typical" Urban Areas and Associated Casualty Curves, DC-FR-1041, The Dikewood Corporation; April, 1965.

APPENDIX A

CODING FORMAT

This section contains a copy of the coding format and a sample code sheet used to code all of the available data. A total of 145 entries or items of interest were coded for each case history. These entries are numbered sequentially from 1 to 145, and the number associated with an entry is given under the heading "Item" in the coding format. The coded data required five IBM cards per case history. The card number associated with a block of data is shown under the heading "Card" in the code format. The section of a card associated with any particular entry is given under the heading "Column". The title of the entry and an explanation of the code relating to the entry are given under the heading "Title and Applicable Card Codes".

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
1	1	1-6	MASTER FILE NUMBER Assign appropriate file number in sequence from 1 to 999, 998 based on source data to be coded. NOTE: Hiroshima case histories start at 1 and end at 34, 999. Nagasaki case histories start at 500, 001 and end at 519, 999.
2	1	7	CITY OF EXPOSURE 1 - Hiroshima 2 - Nagasaki 3 - Other 9 - No data
3	1	8-11	COORDINATES (EAST - WEST)* Enter reading from army map series AMS-L902. Reading to be in tens of yards using the world polyconic grid system. Only four digits are to be recorded; both the hundred thousand and million digits are understood. On the AMS-L902 maps the east-west coordinates are read using the vertical lines drawn on the maps.

*Location of subject at time of burst.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 3 (Continued) NOTE: If coordinates are not given, enter applicable ring number for Hiroshima or applicable direction code number for Nagasaki. If coordinates are unknown, enter 9999.
4	1	12-15	COORDINATES (NORTH - SOUTH)* Enter reading from army map series AMS-L902. Reading to be in tens of yards using the world polyconic grid system. Only four digits are to be recorded; both the hundred thousand and million digits are understood. On the AMS-L902 maps the north-south coordinates are read using the horizontal lines drawn on the maps. NOTE: If coordinates are not given, enter applicable zone number for Hiroshima or applicable zone code number for Nagasaki. If coordinates are unknown, enter 9999.
5	1	16-19	RANGE FROM HYPOCENTER Enter range in yards as stated in the data. NOTE: This entry will be replaced by a computer entry when the AMS-L902 map coordinates are known. Hiroshima hypocenter - 744.281 kiloyards east, 1261.696 kiloyards north Nagasaki hypocenter - 1293.61 kiloyards east, 1065.92 kiloyards north
6	1	20	LOCATOR KEY 1 - Building (specific) 2 - Work party (specific) 3 - Building (general) 4 - In open (general) 5 - Train or streetcar 8 - Location unknown 9 - No data

*Location of subject at time of burst.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
7	1	21-24	LOCATOR NUMBER Locator key (1) Enter number listed opposite USSBS specific building number listed in Table 9.* Locator key (2) Enter number listed opposite specific work party in Table 10. Locator key (3), (4), (5) Enter middle two digits (9-10) from Item 3 and middle two digits (13-14) from Item 4 if coordinates are given. Otherwise, enter 0000 if ring-zone or direction-zone number is given or 9999 if ring-zone or direction-zone number is unknown. Locator key (8), (9) Enter 9999.
8	1	25-26	TYPE OF BUILDING CONSTRUCTION Enter number listed opposite basic type of building construction in Table 11.
9	1	27-28	PRINCIPAL BUILDING USE Enter number listed opposite principal building use in Table 12.
10	1	29-30	NUMBER OF FLOORS (ABOVE GROUND) 00 - Not applicable (not in building) 01-97 - Actual number of floors above ground level 98 - No floors above ground 99 - No data
11	1	31	NUMBER OF FLOORS (BELOW GROUND) 0 - Not applicable (not in building) 1-6 - Actual number of floors below ground level 7 - Underground shelter other than basement 8 - No floors below ground 9 - No data

*All of the tables and figures are presented at the end of this appendix.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
12	1	32	PERCENT OF BUILDING DAMAGE 0 - Not applicable (not in building) 1 - Undamaged 2 - 1-20% 3 - 21-40% 4 - 41-60% 5 - 61-80% 6 - 81-100% 8 - Damage, percent unknown 9 - No data
13	1	33	CAUSE OF BUILDING DAMAGE 0 - Not applicable (not in building) 1 - Undamaged 2 - Blast only 3 - Fire only 4 - Blast and fire 5 - Other 8 - Cause unknown 9 - No data
14	1	34-36	OVERPRESSURE (CALCULATED) No entry required. This entry will be calculated by a computer using range as given in Item 5.
15	1	37-39	THERMAL RADIATION (CALCULATED) No entry required. This entry will be calculated by a computer using range as given in Item 5.
16	1	40-44	NEUTRON RADIATION (CALCULATED) No entry required. This entry will be calculated by a computer using range as given in Item 5.
17	1	45-49	GAMMA RADIATION (CALCULATED) No entry required. This entry will be calculated by a computer using range as given in Item 5.
18	1	50-54	TOTAL NUCLEAR RADIATION (CALCULATED) No entry required. This entry will be calculated by a computer using range as given in Item 5.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
19	1	55-56	SUBJECT INDOORS OR OUTDOORS (ATB)*
			01 - Indoors-concrete building
			02 - Indoors-brick building
			03 - Indoors-steel building
			04 - Indoors-wood-frame building
			05 - Indoors-building type not specified
			06 - Indoors-train or streetcar
			07 - Indoors-air-raid shelter
			08 - Indoors-shielding unknown
			09 - Outdoors-totally shielded by concrete building
			10 - Outdoors-totally shielded by brick building
			11 - Outdoors-totally shielded by steel building
			12 - Outdoors-totally shielded by wood-frame building
			13 - Outdoors-totally shielded by building (type not specified)
			14 - Outdoors-totally shielded by other than building
			15 - Outdoors-totally shielded (shielding unknown)
			16 - Outdoors-partially shielded by concrete building
			17 - Outdoors-partially shielded by brick building
			18 - Outdoors-partially shielded by steel building
			19 - Outdoors-partially shielded by wood-frame building
			20 - Outdoors-partially shielded by building (type not specified)
			21 - Outdoors-partially shielded by other than building
			22 - Outdoors-partially shielded (shielding unknown)
			23 - Outdoors-unshielded
			24 - Foetus case
			99 - No data

*ATB means "at time of burst".

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 19 (Continued) NOTE: If subject was outdoors, but shielded by some type of building, complete Items 25, 26, 27, and 28 as if subject were in a building. If degree of shielding is not specified, list as partially shielded.
20	1	57-58	SUBJECT ON WHAT FLOOR OF BUILDING 00 - Not applicable (not in building) 01-90 - Actual floor number (above ground) where subject was at time of burst 91-97 - Floor number (below ground) from 1 to 7 where subject was at time of burst 98 - In underground shelter other than basement 99 - No data
21	1	59	GENERAL BUILDING SHAPE 0 - Not applicable (not in building) 1-8 - Using diagrams in Fig. 65*, enter code which best approximates the general shape of the building housing the subject 9 - No data
22	1	60-61	SUBJECT'S LOCATION ON FLOOR (ATB) 00 - Not applicable (not in building) 01-98 - Using diagrams shown in Fig. 66., enter code which best approximates orientation of building with respect to hypocenter and subject's location on floor of building at time of burst 99 - No data
23	1	62	RELATION OF SUBJECT TO EXTERIOR BUILDING OPENINGS (ATB) 0 - Not applicable (not in building) 1 - Not in exterior building opening 2 - In exterior building opening and exposed to direct weapon effects 3 - In exterior building opening but not exposed to direct weapon effects

*All of these figures are presented at the end of this appendix.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 23 (Continued) 8 - In exterior building opening (exposure unknown) 9 - No data
24	1	63	PHYSICAL POSITION OF SUBJECT (ATB) 1 - Standing 2 - Sitting or kneeling 3 - Prone 8 - Other 9 - No data
25	1	64	NUMBER OF FLOORS OR CEILINGS SHIELDING SUBJECT (ATB) 0 - None or not applicable 1-8 - Actual number of floors between subject and point of detonation 9 - No data
26	1	65	PRINCIPAL SHIELDING MATERIAL OF FLOORS OR CEILINGS 0 - Not applicable 1 - Concrete 2 - Brick or stone 3 - Sheet metal 4 - Wood—standard 7 - Other 9 - No data
27	1	66	NUMBER OF WALLS SHIELDING SUBJECT (ATB) 0 - None or not applicable 1-8 - Actual number of walls between subject and point of detonation 9 - No data
28	1	67	PRINCIPAL SHIELDING MATERIAL OF WALLS 0 - Not applicable 1 - Concrete 2 - Brick or stone 3 - Sheet metal 4 - Wood—standard 5 - Wood—mud/oyster shell/bamboo lath 6 - Wood—type not specified 7 - Other 9 - No data

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
29	1	68	OTHER BUILDING FEATURES SHIELDING SUBJECT (ATB) 0 - None or not applicable 1 - Concrete pillar or post 2 - Brick or stone pillar or post 3 - Steel pillar or post 4 - Wood pillar or post 5 - Concrete stairway 6 - Wood stairway 7 - Other 9 - No data
30	1	69	TYPE OF AIR-RAID SHELTER USED BY SUBJECT (ATB) 0 - Not applicable (not in air-raid shelter) 1 - Concrete only 2 - Earth only 3 - Concrete and earth 4 - Tunnel or cave 5 - Open trench or excavation 6 - Other 9 - No data
31	1	70-72	AMOUNT OF CONCRETE SHIELDING SUBJECT IN SHELTER (ATB) 000 - None or not applicable 001-997 - Actual amount of concrete in inches between subject and point of detonation 998 - Concrete shielding-amount unknown 999 - No data
32	1	73-75	AMOUNT OF EARTH SHIELDING SUBJECT IN SHELTER (ATB) 000 - None or not applicable 001-997 - Actual amount of earth in inches between subject and point of detonation 998 - Earth shielding-amount unknown 999 - No data
33	1	76	DIRECTION OF SHELTER OPENINGS WRT* HYPOCENTER (ATB) 0 - Not applicable (not in shelter)

*WRT means "with respect to".

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 33 (Continued) 1-8 - Using diagram shown in Fig. 67, enter code which best approximates relation of shelter opening wrt hypocenter. In case of more than one shelter opening, code one with direction of opening nearest hypocenter. 9 - No data
34	1	77	LOCATION OF SUBJECT IN SHELTER WRT SHELTER OPENINGS (ATB) 0 - Not applicable (not in shelter) 1 - Not in shelter opening 2 - In shelter opening (unshielded) 3 - In shelter opening (partially shielded) 4 - In shelter opening (shielded) 8 - In shelter opening (shielding unknown) 9 - No data
35	1	78	SHIELDING OF SUBJECT IN OPEN (ATB) 0 - Not applicable (not in open) 1 - Totally shielded 2 - Partially shielded 3 - Totally unshielded 8 - Shielding unknown 9 - No data
36	1	79	MATERIAL SHIELDING SUBJECT IN OPEN (ATB) 0 - Not applicable (not in open) 1 - No shielding 2 - Wall or fence (concrete, brick, or stone) 3 - Wall or fence (wood) 4 - Terrain 5 - Tree, bush, or other foliage 6 - Human 7 - Building 8 - Other 9 - No data
	1	80	A "1" to indicate that this is the first of five cards.
	2	1	A "2" to indicate that this is the beginning of the second card.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
37	2	2	DATA SEARCH No entry required. Used by the computer to isolate specific information.
38	2	3-8	DATA SOURCE FILE/CASE NUMBER Enter file number or case number as given on iriginal source material. Enter 999999 if not listed.
39	2	9-12	FREE-AIR GAMMA RADIATION CALCULATIONS OR SHIELDING CALCULATIONS FOR HEAD (WATER) Enter actual number as given in the source material for free-air gamma radiation or for shielding in gms/cm^2 of water. Enter 9999 if unknown or not listed.
40	2	13-16	FREE-AIR NEUTRON RADIATION CALCULATIONS OR SHIELDING CALCULATIONS FOR BODY (WATER) Enter actual number as given in the source material for free-air neutron radiation or for shielding in gms/cm^2 of water. Enter 9999 if unknown or not listed.
41	2	17-19	GAMMA TRANSMISSION FACTOR CALCULATIONS OR SHIELDING CALCULATIONS FOR HEAD (CONCRETE) Enter actual number as given in the source material for gamma transmission factor or for shielding in inches of concrete. Enter 999 if unknown or not listed.
42	2	20-22	NEUTRON TRANSMISSION FACTOR CALCULATIONS OR SHIELDING CALCULATIONS FOR BODY (CONCRETE) Enter actual number as given in the source material for neutron transmission factor or for shielding in inches of concrete. Enter 999 if unknown or not listed.
43	2	23-28	GAMMA RADIATION BIOLOGICAL DOSE No entry required. This information will be calculated by the computer using information from Items 17 and 39-42.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
44	2	29-34	NEUTRON RADIATION BIOLOGICAL DOSE No entry required. This information will be calculated by the computer using information from Items 16 and 39-42.
45	2	35	OCCUPATION OF SUBJECT (ATB) Enter number listed opposite occupation in Table 13.
46	2	36	RELATION OF LOCATION WRT OCCUPATION (ATB) 1 - In school 2 - At place of work 3 - On way to work (unshielded) 4 - On way to work (shielded) 5 - In work party 6 - In private home 7 - In public building 8 - Other 9 - No data
47	2	37	REACTION OF SUBJECT TO AIR-RAID WARNING (ATB) 0 - Did not hear warning 1 - Heard warning and took shelter (remaining there until after detonation) 2 - Heard warning and took shelter (emerging prior to detonation) 3 - Heard warning and remained indoors 4 - Heard warning but ignored it 5 - Heard warning and proceeded to military or civil defense station 9 - No data
48	2	38	MEDICAL CONDITION OF SUBJECT (PTB)* 1 - Well 2 - Ill (ambulatory) 3 - Ill (non-ambulatory)

*PTB means "prior to burst".

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 48 (Continued) 4 - Injured (ambulatory) 5 - Injured (non-ambulatory) 9 - No data
49	2	39	MEDICAL CONDITION OF SUBJECT (IAB)* 1 - Well 2 - Injured (ambulatory) 3 - Injured (non-ambulatory) 4 - Deceased 8 - No change from condition prior to burst 9 - No data NOTE: Enter 1, 2, 3, or 4 as a result of bombing only. Enter an 8 if there is no significant change from medical condition prior to burst.
50	2	40	RESCUE OF SUBJECT 0 - Not trapped 1 - Not rescued 2 - Self-rescued 3 - Rescued by family 4 - Rescued by friends 5 - Rescued by neighbors 6 - Rescued by other than family, friends, or neighbors 9 - No data
51	2	41	ELAPSED TIME FROM BLAST TO RESCUE 0 - Not applicable 1 - Immediately after detonation 2 - Within 10 minutes after detonation 3 - Between 10 and 30 minutes after detonation 4 - Between 30 and 60 minutes after detonation 5 - More than 60 minutes after detonation 6 - Not rescued 8 - Rescued (time not specified) 9 - No data

---

*IAB means "immediately after burst".

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
52	2	42-43	NUMBER OF PERSONS EXPOSED WITH SUBJECT (AT SAME LOCATION) 01-97 - Actual number of persons including subject 98 - Exact number unknown 99 - No data NOTE: If 98 or more, code 97.
53	2	44-45	NUMBER OF PERSONS KILLED IMMEDIATELY (AT SAME LOCATION) 00 - None 01-97 - Actual number of persons including subject, if applicable. (Do not include any people who were trapped and subsequently died in the fire.) 98 - Exact number unknown 99 - No data NOTE: If 98 or more, code 97.
54	2	46-47	NUMBER OF PERSONS TRAPPED AND KILLED BY FIRE (AT SAME LOCATION) 00 - None 01-97 - Actual number of persons including subject, if applicable. (Include only those who were thought to be alive prior to fire.) 98 - Exact number unknown 99 - No data NOTE: If 98 or more, code 97.
55	2	48	ABOVE LOCATION DEFINED 0 - Not applicable (subject alone) 1 - Outdoors–small group 2 - Outdoors–large group (30 or more) 3 - Outdoors–work party 4 - Indoors–room or hall 5 - Indoors–particular floor 6 - Indoors–entire building

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 55 (Continued) 7 - Indoors—train or streetcar 8 - General area—no definite limits 9 - No data
56	2	49-50	NUMBER OF PERSONS ESCAPING WITH SUBJECT 00 - Not applicable (did not escape) 01-97 - Actual number of persons including subject 98 - Exact number unknown 99 - No data NOTE: If 98 or more, code 97.
57	2	51	GENERAL DIRECTION OF ESCAPE 0 - Not applicable 1-7 - Using diagram shown in Fig. 68 , enter code which best approximates the general direction of escape of subject 8 - Direction of escape unknown 9 - No data
58	2	52	RETURN TO AREA 0 - Not applicable 1 - Did not return or returned after 90 days after detonation 2 - Returned within 8 hours after detonation 3 - Returned between 8 and 24 hours after detonation 4 - Returned between 1 and 3 days after detonation 5 - Returned between 3 and 30 days after detonation 6 - Returned between 30 and 90 days after detonation 8 - Returned—time not specified 9 - No data
59	2	53	FIRST NOTICE OF FIRE BY SUBJECT 0 - Not applicable 1 - No fires noticed by subject 2 - Immediately after detonation 3 - Within 5 minutes after detonation 4 - Between 5 and 15 minutes after detonation 5 - Between 15 and 30 minutes after detonation

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 59 (Continued) 6 - More than 30 minutes after detonation 8 - Fire-time not specified 9 - No data
60	2	54	CAUSE OF FIRES 0 - Not applicable 1 - Primary weapon effects (thermal radiation) 2 - Secondary effects (stoves, etc.) 3 - Secondary effects (utilities) 4 - Spreading from other burning buildings or objects 5 - Other 8 - Fire-cause unknown 9 - No data
61	2	55	TIME ELAPSED UNTIL FIRES MERGED 0 - Not applicable 1 - Not noticed by subject 2 - Within 15 minutes after detonation 3 - Between 15 and 30 minutes after detonation 4 - Between 30 and 45 minutes after detonation 5 - Between 45 and 60 minutes after detonation 6 - More than 60 minutes after detonation 8 - Fires merged-time not specified 9 - No data
62	2	56	SURVIVAL OF SUBJECT WRT FIRE 0 - Not in fire area 1 - Fled fire area 2 - Deceased (prior to fire) 3 - Deceased (during fire) 4 - Remained in fire area (sheltered by building) 5 - Remained in fire area (sheltered by river, cistern, or other water) 6 - Remained in fire area (sheltered by open area) 7 - Remained in fire area (sheltered by cave, tunnel, or other shelter) 8 - Remained in fire area (shelter unknown) 9 - Survived-no data

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
63	2	57-60	LOCATION OF SHELTER USED DURING FIRE Item 62 (0), (1), (2), or (3) Enter 0000 Item 62 (4) Enter building number if given in Table 9 or enter middle two digits from Coordinates (East - West) and middle two digits from Coordinates (North - South). Use coordinates describing shelter for fire only. Enter 9999 if coordinates are unknown. Item 62 (5), (6), or (7) Enter middle two digits from Coordinates (East - West) and middle two digits from Coordinates (North - South). Use coordinates describing shelter for fire only. Enter 9999 if coordinates are unknown. Item 62 (8) or (9) Enter 9999
64	2	61	CONDITION OF SHELTER WRT FIRE 0 - Not applicable (not in shelter) 1 - No fire in shelter 2 - Minor fires (extinguished) 3 - Minor fires (not extinguished) 4 - Major fires (extinguished) 5 - Major fires (not extinguished–forced subject to flee) 8 - Fire in shelter–no other information 9 - No data
65	2	62-64	NEAREST BURNING BUILDING TO SHELTER 000 - Not applicable 001-997 - Approximate number of yards from nearest burning building to shelter used by subject 998 - Exact distance unknown 999 - No data
66	2	65	FIRE-FIGHTING EFFORTS BY SUBJECT 0 - Not applicable 1 - No fire fighting by subject 2 - Fire fighting by subject at shelter 3 - Fire fighting by subject prior to leaving fire area

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 66 (Continued) 4 - Fire fighting by subject upon returning to fire area 8 - Fire fighting by subject—no other information 9 - No data
67	2	66	FIRE-FIGHTING EFFORTS BY OTHERS 0 - Not applicable 1 - No fire fighting by others noted by subject 2 - Fire fighting by others at shelter 3 - Fire fighting by others prior to leaving fire area 4 - Fire fighting by others upon return to fire area 8 - Fire fighting by others—no other information 9 - No data
68	2	67	FIRE-FIGHTING LOCATOR KEY 0 - Not applicable 1 - Building (specific) 2 - Building (general) 3 - Area (general) 8 - Fire fighting (area unknown) 9 - No data
69	2	68-71	FIRE-FIGHTING LOCATOR NUMBER Fire-fighting locator key (0) Enter 0000. Fire-fighting locator key (1) Enter number listed in Table 9. Fire-fighting locator key (2) or (3) Enter middle two digits from Coordinates (East - West) and middle two digits from Coordinates (North - South). Enter 9999 if coordinates are unknown. Fire-fighting locator key (8) or (9) Enter 9999.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
70	2	72	EFFECT OF FIRE FIGHTING 0 - Not applicable 1 - Unable to control fire spread in area 2 - Able to control fire spread in area 3 - Able to extinguish small fires in building or shelter 4 - Able to control (but not extinguish) fire in building or shelter 5 - Unable to control fire in building or shelter 8 - Fire fighting-effect unknown 9 - No data
71	2	73-78	DATE OF INTERVIEW Enter month of interview in first two blanks (Col. 73-74) 00 - Not interviewed 01 - January 02 - February 03 - March 04 - April 05 - May 06 - June 07 - July 08 - August 09 - September 10 - October 11 - November 12 - December 99 - No data Enter day of interview in second two blanks (Col. 75-76) 00 - Not interviewed 01-31 - Actual day of month interviewed 99 - No data Enter year of interview in last two blanks (Col. 77-78) 00 - Not interviewed 45-64 - Actual year of interview 99 - No data

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
72	2	79	INTERVIEW RELIABILITY 0 - Not interviewed 1 - Good 2 - Fair 3 - Poor 4 - Reliability unknown 9 - No data
	2	80	A "2" to indicate that this is the second of five cards.
	3	1	A "3" to indicate that this is the beginning of the third card.
73	3	2-5	DATE OF BIRTH Enter month of birth in first two blanks (Col. 2-3) 00 - In utero 01 - January 02 - February 03 - March 04 - April 05 - May 06 - June 07 - July 08 - August 09 - September 10 - October 11 - November 12 - December 99 - No data Enter year of birth in last two blanks (Col. 4-5) 00 - In utero 01-98 - Actual year of birth 99 - No data NOTE: If the year is coded as 0 or 99 and a month is given, the 0 or 99 is applicable.
74	3	6	SEX 1 - Male 2 - Female 9 - No data or unknown

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
75	3	7-8	AGE (ATB) 00 - In utero 01-98 - Actual age of subject 99 - No data NOTE: Code age to the nearest year. Age in excess of 98 to be coded as 98 and age of less than 1 year to be coded as 01.
76	3	9	IN UTERO 0 - Not an in utero case 1 - Hiroshima-First trimester: Born between February 8, 1946, and May 31, 1946. 2 - Hiroshima-Second trimester: Born between November 7, 1945, and February 7, 1946. 3 - Hiroshima-Third trimester: Born between August 6, 1945, and November 6, 1945. 4 - Nagasaki-First trimester: Born between February 11, 1946, and June 3, 1946. 5 - Nagasaki-Second trimester: Born between November 10, 1945, and February 10, 1946. 6 - Nagasaki-Third trimester: Born between August 9, 1945, and November 9, 1945. 7 - In utero-no other information 9 - No data
77	3	10-15	DATE OF DEATH Enter month of death in first two blanks (Col. 10-11) 00 - Alive 01 - January 02 - February 03 - March 04 - April 05 - May 06 - June 07 - July 08 - August

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 77 (Continued) 09 - September 10 - October 11 - November 12 - December 98 - Date unknown 99 - No data Enter day of death in second two blanks (Col. 12-13) 00 - Alive 01-31 - Actual day of death 98 - Date unknown 99 - No data Enter day of death in last two blanks (Col. 14-15) 00 - Alive 45-64 - Actual year of death 98 - Date unknown 99 - No data
78	3	16	CAUSE OF DEATH 0 - Not applicable (not dead) 1 - Weapons effects 2 - Natural causes 3 - Suicide 4 - Accidental 5 - Dead–cause unknown 9 - No data
79	3	17	PRIME CAUSE OF MECHANICAL INJURIES 0 - No mechanical injuries 1 - Blast (primary) 2 - Flying debris or glass, falling walls, etc. (secondary blast) 4 - Translation (tertiary blast) 8 - Mechanical injuries–cause not recorded 9 - No data NOTE: If more than one injury, code sum.
80	3	18	CUTS, LACERATIONS, AND PUNCTURES 0 - No cuts, lacerations, and punctures 1 - Cuts, lacerations, and punctures (from glass)

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 80 (Continued) 2 - Cuts, lacerations, and punctures (other than glass) 8 - Cuts, lacerations, and punctures (type not specified) 9 - No data NOTE: If more than one injury, code sum.
81	3	19	CONTUSIONS AND ABRASIONS 0 - No contusions and abrasions 1 - Contusions 2 - Abrasions 4 - Concussion 8 - Contusions, abrasions, or concussion (type not specified) 9 - No data NOTE: If more than one injury, code sum.
82	3	20	FRACTURED BONES 0 - No fractured bones 1 - Compound fracture-one or more of the long bones 2 - Simple fracture-one or more of the long bones 4 - Fracture (other than long bones) or dislocations 8 - Fractured bones (type not specified) 9 - No data NOTE: If more than one injury, code sum.
83	3	21	OTHER BLAST EFFECTS 0 - No other blast effects 1 - Ruptured drums 2 - Tinnitus, headache, dizziness, vertigo, clouding of consciousness 4 - Loss of consciousness due to blast 8 - Other blast effects-type not specified 9 - No data NOTE: If more than one injury, code sum.
84	3	22	SEVERITY OF MECHANICAL INJURIES 0 - No mechanical injuries or not applicable 1 - Minor mechanical injuries

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 84 (Continued) 2 - Moderate mechanical injuries 3 - Severe mechanical injuries 8 - Mechanical injuries-degree unknown 9 - No data NOTE: For severity, see Table 14 on mechanical injuries.
85	3	23	HEAD COVERING WORN 1 - No hat worn 2 - Hat worn 9 - No data
86	3	24	CLOTHING WORN 1 - Naked 2 - White only 3 - Colored only 4 - White and colored 8 - Clothed-color not specified 9 - No data
87	3	25-26	BURNS IN RELATION TO CLOTHING Enter layers of clothing worn in first blank (Col. 25) 0 - Naked 1-5 - Actual number of layers of clothing worn 6 - One or more layers-exact number not specified 7 - Two or more layers-exact number not specified 8 - No data Enter burns in relation to clothing in last blank (Col. 26) 0 - No burns 1 - Burns-uncovered areas only 2 - Burns-uncovered areas and under white only 3 - Burns-uncovered areas and under colored only 4 - Burns-uncovered areas and under white and colored 5 - Burns-uncovered areas and under clothing-color not specified

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 87 (Continued) 6 - Burns-under white clothing only 7 - Burns-under colored clothing only 8 - Burns-under white and colored clothing 9 - Burns-under clothing only-color not specified NOTE: If there is no data on burns or relation of burns to clothing, enter 99.
88	3	27	TYPE OF BURNS 0 - No burns 1 - Flash burns only 2 - Flame burns only 3 - Flash and flame burns 8 - Burns-type not specified 9 - No data
89	3	28	AREA OF BURNS 0 - No burns 1 - Head only 2 - Extremities only 4 - Trunk only 8 - Burns-area not specified 9 - No data NOTE: If more than one area, code sum.
90	3	29	PERCENT OF AREA BURNED 0 - No burns 1 - Under 2% 2 - 3-9% 3 - 10-19% 4 - 20-29% 5 - 30-49% 6 - 50-69% 7 - 70% or more 8 - Percent unknown 9 - No data
91	3	30	SEVERITY OF BURNS 0 - No burns 1 - First degree 2 - Second degree

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 91 (Continued) 3 - Third degree 8 - Burns-severity unknown 9 - No data NOTE: For severity, see Table 14 on burn injury.
92	3	31-32	VOMITING 00 - No vomiting 01-94 - Code actual days from bomb to onset 95 - Present, between 1st and 21st day 96 - Present, between 22nd and 60th day 97 - Present, after 60 days 98 - Present, date not specified 99 - No data NOTE: Day of bomb is 1st day. If 95 days or more, code 94.
93	3	33-34	DURATION OF VOMITING 00 - No vomiting 01-97 - Code actual days of duration 98 - Present, duration not specified 99 - No data NOTE: If 98 days or more, code 97.
94	3	35-36	DIARRHEA 00 - No diarrhea 01-93 - Code actual days from bomb to onset 94 - Present, within 7 days 95 - Present, between 8 and 21 days 96 - Present, between 22 and 60 days 97 - Present, after 60 days 98 - Present, date not specified 99 - No data NOTE: Day of bomb is 1st day. If 94 days or more, code 93.
95	3	37-38	DURATION OF DIARRHEA 00 - No diarrhea 01-97 - Code actual days of duration 98 - Present, duration not specified 99 - No data NOTE: If 98 days or more, code 97.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
96	3	39-40	BLOODY DIARRHEA
			00 - No bloody diarrhea
			01-93 - Code actual days from bomb to onset
			94 - Present, within 7 days
			95 - Present, between 8 and 21 days
			96 - Present, between 22 and 60 days
			97 - Present, after 60 days
			98 - Present, date not specified
			99 - No data
			NOTE: Day of bomb is 1st day. If 94 days or more, code 93.
97	3	41	MALAISE AND ANOREXIA
			0 - No malaise or anorexia
			1 - Malaise
			2 - Anorexia
			3 - Malaise and anorexia
			8 - Malaise or anorexia–type not specified
			9 - No data
98	3	42-43	GINGIVITIS AND PHARYNGITIS
			00 - No gingivitis and pharyngitis
			01-94 - Code actual days from bomb to onset
			95 - Present, within 21 days
			96 - Present, between 22 and 60 days
			97 - Present, after 60 days
			98 - Present, date not specified
			99 - No data
			NOTE: Day of bomb is 1st day. If 95 days or more, code 94.
99	3	44-45	DURATION OF GINGIVITIS AND PHARYNGITIS
			00 - No gingivitis and pharyngitis
			01-97 - Code actual days of duration
			98 - Present, duration not specified
			99 - No data
			NOTE: If 98 days or more, code 97.
100	3	46-47	NECROTIC GINGIVITIS AND PHARYNGITIS
			00 - No necrotic gingivitis and pharyngitis
			01-97 - Code actual days from bomb to onset
			98 - Present, date not specified
			99 - No data

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 100 (Continued) NOTE: Day of bomb is 1st day. If 98 days or more, code 97.
101	3	48-49	PURPURA OR PETECHIAE 00 - No purpura or petechiae 01-93 - Code actual days from bomb to onset 94 - Present, within 21 days 95 - Present, between 22 and 42 days 96 - Present, between 43 and 60 days 97 - Present, after 60 days 98 - Present, date not specified 99 - No data NOTE: Day of bomb is 1st day. If 94 days or more, code 93.
102	3	50-51	DURATION OF PURPURA OR PETECHIAE 00 - No purpura or petechiae 01-97 - Code actual days of duration 98 - Present, duration not specified 99 - No data NOTE: If 98 days or more, code 97.
103	3	52	HEMORRHAGE, OTHER THAN PURPURA, PETECHIAE, OR BLOODY STOOLS 0 - No hemorrhage 1 - Hemorrhage 9 - No data
104	3	53	PERCENT OF SCALP EPILATION 0 - No epilation (0-5%) 1 - Slight (6-25%) 2 - Moderate (26-50%) 3 - Marked (51-75%) 4 - Severe (76-100%) 5 - Present (degree unknown) 8 - Death case (onset and degree unknown) 9 - No data
105	3	54-55	EPILATION OF SCALP (ONSET DATE ONLY) 00 - No epilation of scalp 01-93 - Code actual days from bomb to onset 94 - Present, within 21 days

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 105 (Continued) 95 - Present, between 22 and 60 days 96 - Present, after 60 days 97 - Present, date not specified 98 - Death case-onset unknown 99 - No data NOTE: Day of bomb is 1st day. If 94 days or more, code 93.
106	3	56	EPILATION OF PARTS OTHER THAN THE SCALP 0 - No epilation of parts other than the scalp 1 - Epilation of parts other than the scalp 9 - No data
107	3	57	SKIN AND SWEATING 0 - Normal sweating and/or skin pigmentation 1 - Abnormal skin pigmentation 2 - Absence of sweating 3 - Abnormal skin pigmentation and absence of sweating 8 - Abnormal skin pigmentation or absence of sweating—type not specified 9 - No data
108	3	58	ABNORMALITIES OF REPRODUCTIVE SYSTEM 0 - No effect on menstruation or potency 1 - Abnormal menstruation or abnormal male symptoms (normal before bomb) 2 - Abnormal menstruation or abnormal male symptoms (abnormal before bomb) 3 - Abnormal menstruation or abnormal male symptoms (unknown before bomb) 4 - Abortion or born dead 5 - Pregnant, no abortion 6 - Premature delivery, baby born alive 7 - After menopause or before menstruation 8 - Reproductive system abnormalities—type not specified 9 - No data

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
109	3	59	FEVER 0 - No fever 1 - Fever occurred within 7 days 2 - Fever occurred between 8 and 21 days 3 - Fever occurred between 22 and 60 days 4 - Fever occurred after 60 days 8 - Fever date–unknown 9 - No data
110	3	60	EYE INJURIES 0 - No eye injury 1 - Burns 2 - Wound 4 - Hemorrhage 8 - Eye injury–type not specified 9 - No data NOTE: If more than one injury, code sum.
111	3	61-66	DATE OF HOSPITAL ADMITTANCE Enter month of hospital admittance in first two blanks (Col. 61-62) 00 - Not admitted 01 - January 02 - February 03 - March 04 - April 05 - May 06 - June 07 - July 08 - August 09 - September 10 - October 11 - November 12 - December 98 - Hospitalized–date unknown 99 - No data Enter day of hospital admittance in second two blanks (Col. 63-64) 00 - Not admitted 01-31 - Actual day of admittance 98 - Hospitalized–date unknown 99 - No data

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 111 (Continued) Enter year of hospital admittance in last two blanks (Col. 65-66) 00 - Not admitted 45-64 - Actual year admitted 98 - Hospitalized–date unknown 99 - No data
112	3	67-72	DATE OF HOSPITAL DISCHARGE OR DEATH Enter month of discharge or death in first two blanks (Col. 67-68) 00 - Not applicable 01 - January 02 - February 03 - March 04 - April 05 - May 06 - June 07 - July 08 - August 09 - September 10 - October 11 - November 12 - December 98 - Discharge or death–date unknown 99 - No data Enter day of discharge or death in second two blanks (Col. 69-70) 00 - Not applicable 01-31 - Actual day discharged or died 98 - Discharge or death–date unknown 99 - No data Enter year of discharge or death in last two blanks (Col. 71-72) 00 - Not applicable 45-64 - Actual year discharged or died 98 - Discharge or death–date unknown 99 - No data
113	3	73-74	PLACE OF EXAMINATION 00 - Not applicable (not examined) 01-97 - Enter code opposite place of examination from Table 15

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 113 (Continued) 98 - Examined-place not specified 99 - No data
114	3	75	MOST SEVERE INJURY TREATED 0 - Not applicable 1 - Questionable radiation effects 2 - Moderate radiation effects 3 - Severe radiation effects 4 - Moderate flash and/or flame burns 5 - Severe flash and/or flame burns 6 - Moderate mechanical injuries 7 - Severe mechanical injuries 9 - No data NOTE: For criteria on severity, see Table 14.
115	3	76	SECOND MOST SEVERE INJURY TREATED 0 - Not applicable 1 - Questionable radiation effects 2 - Moderate radiation effects 3 - Severe radiation effects 4 - Moderate flash and/or flame burns 5 - Severe flash and/or flame burns 6 - Moderate mechanical injuries 7 - Severe mechanical injuries 9 - No data NOTE: For criteria on severity, see Table 14.
116	3	77	THIRD MOST SEVERE INJURY TREATED 0 - Not applicable 1 - Questionable radiation effects 2 - Moderate radiation effects 3 - Severe radiation effects 4 - Moderate flash and/or flame burns 5 - Severe flash and/or flame burns 6 - Moderate mechanical injuries 7 - Severe mechanical injuries 9 - No data NOTE: For criteria on severity, see Table 14.
117	3	78	MAJOR COMPLICATIONS 0 - None or not applicable 1 - Respiratory disease

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 117 (Continued) 2 - Other contagious or epidemic diseases 3 - Digestive disorders 4 - Starvation, malnutrition, or emaciation 5 - Severe infections 6 - High fever (39°C or more) 7 - Fever (36°C to 38°C) or not specified 8 - Other disorders 9 - No data
118	3	79	OTHER COMPLICATIONS 0 - None or not applicable 1 - Respiratory disease 2 - Other contagious or epidemic diseases 3 - Digestive disorders 4 - Starvation, malnutrition, or emaciation 5 - Severe infections 6 - High fever (39°C or more) 7 - Fever (36°C to 38°C) or not specified 8 - Other disorders 9 - No data
	3	80	A "3" to indicate that this is the third of five cards.
	4	1	A "4" to indicate that this is the beginning of the fourth card.
119	4	2	TYPE OF PATIENT 0 - Not applicable 1 - Hospital case 2 - Dispensary case (outpatient) 3 - Home treatment 4 - Control (outskirts-3000 yards or more from hypocenter) 9 - No data
120	4	3-4	LOWEST RED BLOOD CELL COUNT 01-98 - Record to nearest 100,000 99 - No data NOTE: If 9,900,000 or more, code 98.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
121	4	5	LOWEST HEMOGLOBIN 0 - Under 20% 1 - 20-29% 2 - 30-39% 3 - 40-49% 4 - 50-59% 5 - 60-69% 6 - 70-79% 7 - 80-89% 8 - Over 90% 9 - No data NOTE: If given in grams, multiply by 7 to obtain percent.
122	4	6-7	LOWEST WHITE BLOOD CELL COUNT 01-98 - Code to nearest 100 99 - No data NOTE: If 9, 900 or more, code 98
123	4	8-9	DATE OF FIRST TREATMENT 00 - Not applicable 01-97 - Code actual number of days from bombing to first treatment received by subject 98 - Date not specified 99 - No data NOTE: Day of bomb is 1st day. The first day the subject received any treatment is the date to be coded. If subject died before receiving treatment, code 00. If treatment started after 97 days, code 97.
124	4	10-11	DATE PATIENT LAST SEEN 00 - Not applicable 01-97 - Code actual number of days from bombing to day patient was last seen 98 - Date not specified 99 - No data NOTE: Day of bomb is 1st day. The last day the subject was seen is the date to be coded. If the subject died after receiving treatment, code date of death. If last treatment occurred after 97 days, code 97.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
125	4	12-13	BLAST DATA AVAILABLE 00 - No mechanical injury 01 - Primary blast injury data available 02 - Secondary blast injury (from flying glass) data available 04 - Secondary blast injury (from other than flying glass) data available 08 - Tertiary blast injury data available 50 - Scaling data available 99 - No data NOTE: If more than one entry, code sum.
126	4	14	OTHER MEDICAL EFFECTS 0 - None 1 - Cataracts 2 - Leukemia 4 - Keloids 9 - No data NOTE: If more than one, code sum.
127	4	15	ADDITIONAL ITEMS OF INTEREST (PART 1) 0 - None 1 - Building diagrams included 2 - Narrative included 4 - Shielding measurement diagrams included 8 - Work party placement diagrams included NOTE: If more than one item of interest, code sum.
128	4	16	ADDITIONAL ITEMS OF INTEREST (PART 2) 0 - None 1 - Autopsy performed 2 - Building diagrams available 4 - Narrative included 8 - Other special interest NOTE: If more than one item of interest, code sum.
129	4	17	READABILITY OF ORIGINAL RECORDS 1 - Good 2 - Fair 3 - Poor

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
130	4	18-23	CASE NUMBER OF PERSON EXPOSED WITH SUBJECT (ATB) Code actual case number as given on the record. If none is listed, code 000000.
131	4	24-29	CASE NUMBER OF PERSON EXPOSED WITH SUBJECT (ATB) Code actual case number as given on the record. If none is listed, code 000000.
132	4	30-35	CASE NUMBER OF PERSON EXPOSED WITH SUBJECT (ATB) Code actual case number as given on the record. If none is listed, code 000000.
133	4	36-41	CASE NUMBER OF PERSON EXPOSED WITH SUBJECT (ATB) Code actual case number as given on the record. If none is listed, code 000000.
134	4	42-47	CASE NUMBER OF PERSON EXPOSED WITH SUBJECT (ATB) Code actual case number as given on the record. If none is listed, code 000000.
135	4	48-53	CASE NUMBER OF PERSON EXPOSED WITH SUBJECT (ATB) Code actual case number as given on the record. If none is listed, code 000000.
136	4	54-59	CASE NUMBER OF PERSON EXPOSED WITH SUBJECT (ATB) Code actual case number as given on the record. If none is listed, code 000000.
137	4	60-65	CASE NUMBER OF PERSON EXPOSED WITH SUBJECT (ATB) Code actual case number as given on the record. If none is listed, code 000000.
138	4	66-71	CASE NUMBER OF PERSON EXPOSED WITH SUBJECT (ATB) Code actual case number as given on the record. If none is listed, code 000000.

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
139	4	72-77	CASE NUMBER OF PERSON EXPOSED WITH SUBJECT (ATB) Code actual case number as given on the record. If none is listed, code 000000.
140	4	78	ADDITIONAL INFORMATION ON PERSONS EXPOSED WITH SUBJECT (ATB) 0 - Not applicable or less than 10-all identified 1 - More than 10 persons exposed with subject-additional case numbers given on original data-all persons are identified 2 - More than 10 persons exposed with subject-additional case numbers given on original data-not all persons are identified 3 - Other persons exposed with subject-not all are identified 9 - No data NOTE: See Item 52 for exact number of persons exposed with subject (ATB)
141	4	79	PROJECT 1 - 1044 2 - 1045
	4	80	A "4" to indicate that this is the end of the fourth card.
	5	1	A "5" to indicate that this is the beginning of the fifth and final card.
142	5	2-30	NAME Enter name of subject
143	5	31-60	ADDRESS Enter address of subject
144	5	61-65	B-FILE CODE NUMBER 1 - A 2 - E 3 - I 4 - O 5 - U

ITEM	CARD	COLUMN	TITLE AND APPLICABLE CARD CODES
			ITEM 144 (Continued) NOTE: Code first initial of last name (A-Z) alphabetically and all following vowels numerically according to code.
145	5	66-79	L-SOUNDEX CODE NUMBER 0 - A, E, I, O, U, H, W, Y 1 - B, F, P, V 2 - C, G, J, K, Q, S, X, Z 3 - D, T, 4 - L 5 - M, N 6 - R NOTE: Code first initial of last name (A-Z) and all following letters according to code. Double letters are coded as a single (LL=L or 4).

A sample code sheet is presented in Fig. 69. A glossary is also given at the end of this appendix.

TABLE 9

CODES FOR SPECIFIC PUBLIC BUILDINGS

HIROSHIMA

Code No.	USSBS No. *	Code No.	USSBS No. *	Code No.	USSBS No. *
1	1	34	32C	67	60
2	2	35	32D	68	61
3	3	36	32E	69	62
4	4	37	32F	70	63
5	5	38	32G	71	64
6	6	39	32H	72	65
7	7	40	33	73	66A
8	8	41	34	74	66B
9	9	42	35A	75	66C
10	10	43	36	76	66D
11	11	44	37	77	67
12	12	45	38	78	68A
13	13	46	39	79	68B
14	14	47	40	80	68C
15	15	48	41	81	69
16	16	49	42	82	70
17	17	50	43	83	71
18	18	51	44	84	72
19	19	52	45	85	73
20	20	53	46	86	74
21	21	54	47	87	75
22	22	55	48	88	76
23	23	56	49	89	77
24	24	57	50	90	78
25	25	58	51	91	79
26	26	59	52	92	80
27	27	60	53	93	81
28	28	61	54	94	82
29	29	62	55	95	83
30	30	63	56	96	84
31	31	64	57	97	85
32	32A	65	58	98	86
33	32B	66	59	99	87A

*Building numbers as listed in Ref. 1.

TABLE 9 (Continued)

CODES FOR SPECIFIC PUBLIC BUILDINGS

HIROSHIMA

Code No.	USSBS No.	Code No.	USSBS No.
100	87B	136	113E
101	88	137	113F
102	89	138	113G
103	90	139	114A, B
104	91	140	115
105	92	141	116A, B, C, F
106	93	142	116D
107	94	143	116E
108	95	144	116G
109	96	145	116H, I
110	97	146	116L
111	98A	147	116M
112	98B	148	117
113	99	149	118
114	100	150	119
115	101	151	120
116	102A	152	121
117	102B	153	122
118	102C	154	123A
119	103	155	123B
120	104	156	124
121	105	157	125A, B, C
122	106	158	126A
123	107	159	126B
124	108	160	126C
125	109	161	127A
126	110	162	127B, C, D, E, F
127	111	163	128
128	112A	164	129
129	112B	165	130
130	112C	166	131A
131	112D, E	167	131B
132	113A	168	132
133	113B	169	133
134	113C	170	134
135	113D	171	135

TABLE 9 (Continued)

CODES FOR SPECIFIC PUBLIC BUILDINGS

NAGASAKI

Code No.	USSBS No. *	Code No.	USSBS No. *	Code No.	USSBS No. *
200	4-1	231	4-30	262	26-18
201	4-2	232	4-31	263	26-19
202	4-3	233	4-32	264	26-20
203	4-4	234	4-33	265	26-21
204	4-5	235	4-34	266	26-22
205	4-5A	236	4-35	267	26-23
206	4-6	237	4-36	268	26-24
207	4-7	238	5-1	269	26-25A
208	4-8	239	5-2	270	26-26
209	4-9	240	5-3	271	26-27
210	4-9C	241	5-5	272	26-28
211	4-9D	242	6-1	273	26-29
212	4-10	243	26-1	274	26-30
213	4-11	244	26-2	275	26-31
214	4-13	245	26-3	276	26-32
215	4-14	246	26-4	277	26-33
216	4-15	247	26-5	278	26-34, 35
217	4-16	248	26-6	279	31-1
218	4-17	249	26-7	280	31-1A
219	4-18	250	26-8	281	31-8
220	4-19	251	26-9	282	31-9
221	4-20	252	26-10A	283	31-10
222	4-21	253	26-10B	284	31-11
223	4-22	254	26-11A	285	33-1
224	4-23	255	26-11B	286	33-2
225	4-24	256	26-11C	287	35-1
226	4-25	257	26-12A	288	35-3
227	4-26	258	26-13	289	36-1
228	4-27	259	26-14	290	36-6
229	4-28	260	26-15	291	36-7
230	4-29	261	26-16	292	36-8

*Building numbers as listed in Ref. 2.

TABLE 9 (Continued)

CODES FOR SPECIFIC PUBLIC BUILDINGS

NAGASAKI

Code No.	USSBS No.	Code No.	USSBS No.	Code No.	USSBS No.
293	36-9	329	52-6	365	13-1
294	36-10	330	52-6A	366	13-2
295	36-11, 12, 13, 14	331	52-7	367	13-3
296	36-15	332	52-8	368	13-7
297	36-16	333	52-9	369	14-1
298	36-17	334	52-10	370	14-2
299	36-18	335	52-12	371	14-3
300	36-19	336	52-14	372	15-1
301	36-20, 21	337	52-15	373	15-2
302	36-22	338	52-16	374	15-3
303	36-23	339	52-17	375	15-4
304	39-1	340	52-18	376	16-1
305	40-1	341	52-20	377	16-2
306	40-2	342	52-22	378	17-1 thru 11,
307	40-3	343	52-23		13, 15, 17
308	40-10	344	1-2		thru 28, 30
309	41-1	345	1-3		thru 35, 37
310	41-3, 6, 8	346	1-5		thru 49, 52
311	41-5	347	1-5A		thru 60, 62
312	44, 45-1	348	1-6	379	17-12
313	44, 45-2	349	1-7	380	17-13A
314	44, 45-3	350	1-7A	381	17-16
315	44, 45-4	351	1-9	382	17-35A
316	44, 45-5	352	7-1	383	17-36
317	44, 45-6	353	7-2	384	17-50
318	50-1	354	8-1	385	17-51
319	50-2	355	9-1	386	17-60A
320	50-3	356	9-2	387	17-61
321	50-9	357	9-3	388	18-1
322	50-10	358	9-4	389	18-2
323	51-1	359	9-5	390	19-1
324	52-1	360	10-1	391	20-4
325	52-2	361	10-3	392	20-5
326	52-3	362	10-3 (annex)	393	20-6, 7, 8
327	52-4	363	10-5, 6, 7	394	20-9
328	52-5	364	10-8	395	20-10

TABLE 9 (Continued)

CODES FOR SPECIFIC PUBLIC BUILDINGS

NAGASAKI

Code No.	USSBS No.
396	20-11
397	20-12
398	20-13
399	20-14
400	20-15
401	20-16
402	20-17
403	20-18
404	20-19
405	20-20
406	20-23
407	20-24
408	20-25
409	20-26
410	20-29
411	20-30
412	20-31
413	20-32
414	20-32A, 34, 34A, 35, 36, 38A
415	20-33
416	20-37
417	20-38
418	20-38B
419	21-1
420	21-2
421	21-3, 4
422	21-6
423	25-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
424	25-12, 13, 14
425	27-1
426	27-2
427	27-3
428	27-4
429	27-5
430	27-6
431	27-7
432	27-8
433	37-1
434	37-2
435	37-3
436	37-4
437	37-5, 6
438	37-7
439	38-1
440	38-2
441	38-3
442	38-4
443	42-1
444	42-2
445	42-3
446	42-4
447	46
448	47
449	48-1
450	48-2
451	48-3
452	48-4
453	48-5
454	70-1
455	70-2
456	72-1
457	72-2
458	73-1
459	73-2
460	76
461	78
462	79
463	80
464	81-1
465	81-2
466	81-4
467	81-5

TABLE 10

CODES FOR HIROSHIMA WORK PARTIES*

Code	Name	Coded Coordinates	Range‡	Shielding	Total in Party
01	Nagato Group	4323x6203	3280	Wooden Bldg.	135
02	Morimoto Group	4324x6195	3215	Wooden Bldg.	33
03	Kuba Group	4323x6180	3118	Unshielded	106
04	Ogata Group	4329x6151	3052	Unshielded	27
05	Tachido Group	4329x6151	3052	Unshielded	60
06	Hino Group	4205x6233	7050	Unshielded	580
07	Higashi Group	4547x6037	1627	Unshielded	207
08	Mishima Group	4568x6068	1572	Unshielded	300

*There were no work parties in Nagasaki.

‡Average range (in yards) to center of work party.

TABLE 11

CODES FOR TYPE OF BUILDING CONSTRUCTION

Code	Building Construction
00	Not applicable
	Wood-framed buildings
21	Single-story or multistory dwelling
22	Single-story or multistory commercial or industrial building
	Masonry load-bearing buildings
31	Single- or two-story dwelling
32	Single- or two-story commercial or industrial building
33	Three- to five-story building
34	Six- to eight-story building
35	Over eight-story building
36	Multistory monumental-type building
	Steel-framed buildings
41	Single-story industrial or commercial, very light-frame building
42	Single-story industrial, light-frame building, cranes of less than 10 tons
43	Single-story industrial building with 10-25 ton cranes
44	30-50 ton cranes
45	60-100 ton cranes
46	Over 100 ton cranes
47	Multistory commercial building, conventional design
48	Multistory, light industrial building
49	Multistory, earthquake-resistant building
	Reinforced-concrete-frame buildings
51	Single-story industrial or commercial, very light-frame building
52	Single-story industrial, light-frame building with cranes of less than 10 tons
53	Single-story industrial building with 10-25 ton cranes
54	30-50 ton cranes
55	60-100 ton cranes
56	Over 100 ton cranes
57	Multistory commercial building, conventional design
58	Multistory industrial building
59	Multistory earthquake-resistant building
91	Multistory windowless blast-resistant-design building

TABLE 11 (Continued)

CODES FOR TYPE OF BUILDING CONSTRUCTION

Code	Building Construction
	Composite-framed buildings (concrete framed with structural steel or wood trusses)
61	Single-story industrial building with cranes of less than 10 tons
62	Single-story industrial building with 10-50 ton cranes
71	Tunnels and earth-covered structures
81	Mines and deep underground facilities
99	No data

TABLE 12

CODES FOR BUILDING USES

Code	Use
00	Vacant or not applicable
01	Air-raid shelter
02	Apartment, barracks, etc.
03	Auditorium, movie, library, hall, etc.
04	Bank
05	Commercial
06	Dwelling (single family)
07	Garage or service station
08	Government
09	Hotel
10	Hospital
11	Manufacturing
12	Military
13	Office
14	Railroad, streetcar, etc.
15	Rooming house (multiple family)
16	School
17	Shrine, temple, or church
18	Store (department)
19	Tea house, restaurant
20	Telephone exchange
21	University
22	Utility (gas, water, electricity, etc.)
23	Warehouse
24	Other
99	No data

TABLE 13

CODES FOR OCCUPATION OF SUBJECT

Code	Occupation
0	None or unemployed
	Infant
1	Student
2	White collar
	Clerk
	Policeman
	Merchant
	Storekeeper
	Salesman
	Tailor
	Railway officer
	Engineer (other than RR)
3	Executive or professional
	Teacher
	Nurse
	Priest
	Chemist
	Town official
	Businessman
4	Housewife
5	Laborer
	Shoemaker
	Blacksmith
	Groom
	Rice polisher
	Carpenter
	Railway engineer
	Railway porter
	Peddlar
	Printing pressman
	Paper maker
	Mattress maker
	Iron maker
	Woodman
	Cart driver
	Shipyard worker
	Fisherman

TABLE 13 (Continued)

CODES FOR OCCUPATION OF SUBJECT

Code	Occupation
6	Military Soldier Seaman
7	Farmer
8	Other
9	No data

TABLE 14

CRITERIA FOR SEVERITY OF INJURY

1. General:

   a. If each injury is of equal severity, precedence will be coded as follows:
      (1) Nuclear radiation
      (2) Burn
      (3) Mechanical injury

   b. Otherwise, code in proper order.

2. Criteria for nuclear-radiation effects (where no laboratory data are available):

   a. Questionable: Hemorrhagic manifestations or severe oropharyngeal inflammations
   b. Moderate: Epilation alone
   c. Severe: Epilation with any two of the following
      (1) Hemorrhagic manifestations
      (2) Oropharyngeal inflammations
      (3) Nausea and/or vomiting on day of bombing

3. Criteria for nuclear-radiation effects (where laboratory data are available):

   a. Questionable: WBC between 2000 to 4000 alone; or with hemorrhagic manifestations or severe oropharyngeal inflammations
   b. Moderate: WBC between 2000 to 4000 and epilation
   c. Severe: WBC less than 2000, or WBC between 2000 to 4000 and epilation with any two of the following
      (1) Hemorrhagic manifestations
      (2) Oropharyngeal inflammations
      (3) Nausea and/or vomiting on day of bombing

4. Criteria for burns, flash or flame:

   a. Moderate:
      (1) 1st degree: less than 20%
      (2) 2nd degree: less than 10%
      (3) 3rd degree: less than 2%

TABLE 14 (Continued)

CRITERIA FOR SEVERITY OF INJURY

b. Severe:
   (1) 1st degree: 20% or more
   (2) 2nd degree: 10% or more
   (3) 3rd degree: 2% or more

5. Criteria for mechanical injury:

a. Minor:
   (1) Mild blast effects

b. Moderate:
   (1) Single laceration, cut, abrasion, contusion, etc. (excluding minor injuries)
   (2) Simple fracture, <u>not</u> of a long bone

c. Severe:
   (1) Multiple lacerations, cuts, abrasions, contusions, etc.
   (2) Fracture of one or more long bones, simple or compound; compound fracture of other bone or bones; fracture of skull; fracture of spine

TABLE 15

CODES FOR PLACE OF EXAMINATION

Code	Name
	Nagasaki
01	Kyushu University (hospital)
02	Omura Hospital
03	Shinkosen Hospital
04	Shinkosen Dispensary
05	Manhattan
	Hiroshima
10	Ajina
11	City Hall
12	Eba Branch of 1st Army Hospital
13	Funakoshi
14	Fukoyama Army Hospital
15	Gion - Nagatsuka
16	Hiroshima High School
17	Hiroshima Railroad
18	Prefectural Hospital
19	Kramer Girls
20	Kaidachi
21	Koimachi
22	Kobe University
23	Kyoto Prefectural Medical School (cases studied at Kyoto)
24	Kyoto Prefectural Medical School (cases studied at Hiroshima)
25	Kaijin - Kai - Kure
26	Kyoto University
27	Mitsubishi Hospital
28	Niho
29	Okayama Medical School
30	Okayama Military Hospital
31	Onaga
32	Ono Hospital
33	Osaka Medical School
34	Otaki
35	Ouzu
36	Post Office Hospital
37	Early Post Office cases
38	Prison
39	Red Cross Hospital
40	Saijo

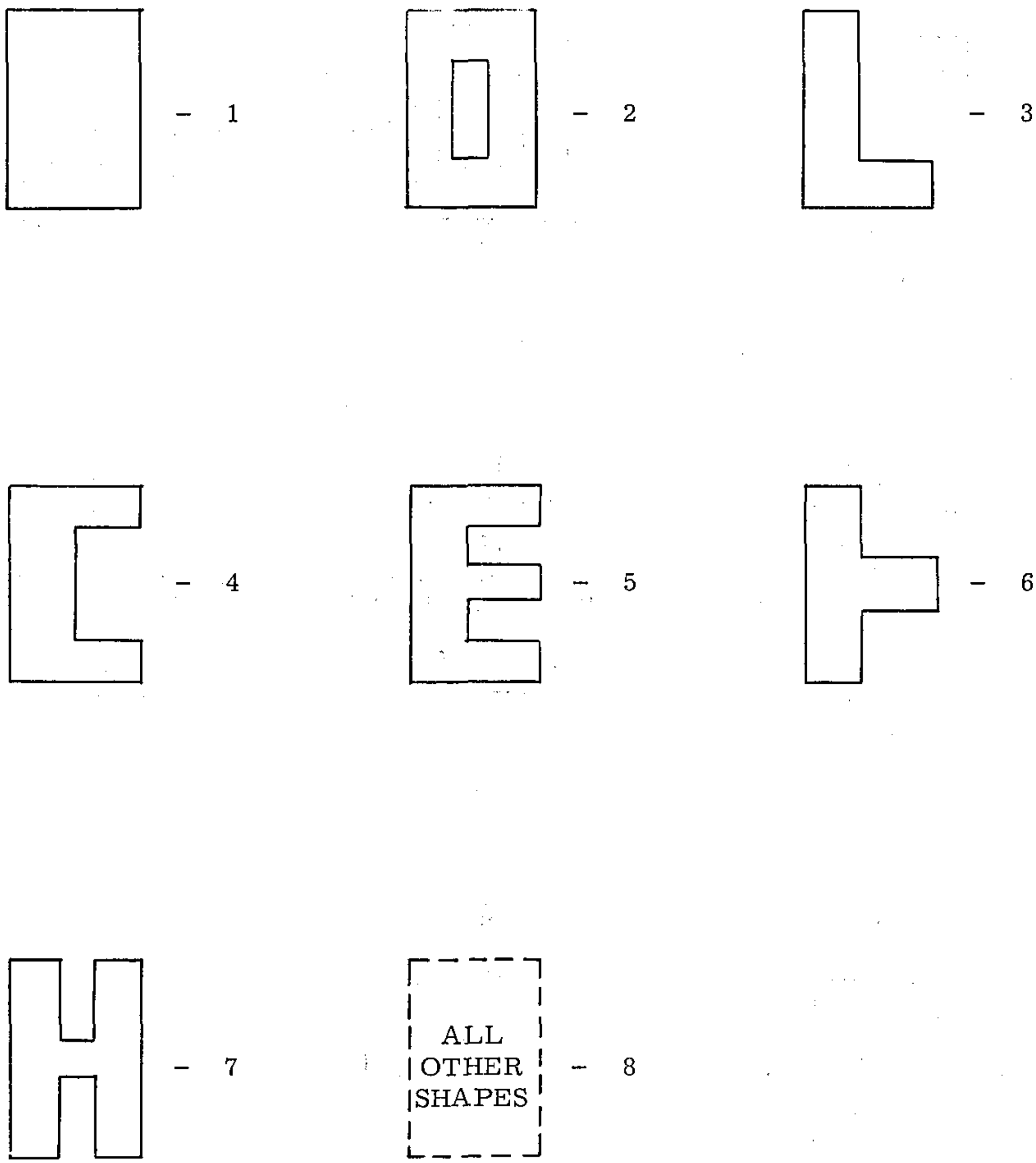
TABLE 15 (Continued)

CODES FOR PLACE OF EXAMINATION

Code	Name
	Hiroshima
41	Second Army Hospital
42	Tottori Army Hospital
43	Takatsuki Branch of the Osaka Medical Faculty
44	Tokyo University
45	Ujina Hospital
46	Ushita
47	Ujina Public School No. 1
48	Ujina Public School No. 2
49	Ushida Hospital
50	Mixed group
51	Yaga
52	Yokoguwa
53	Iwikuni

FIG. 65

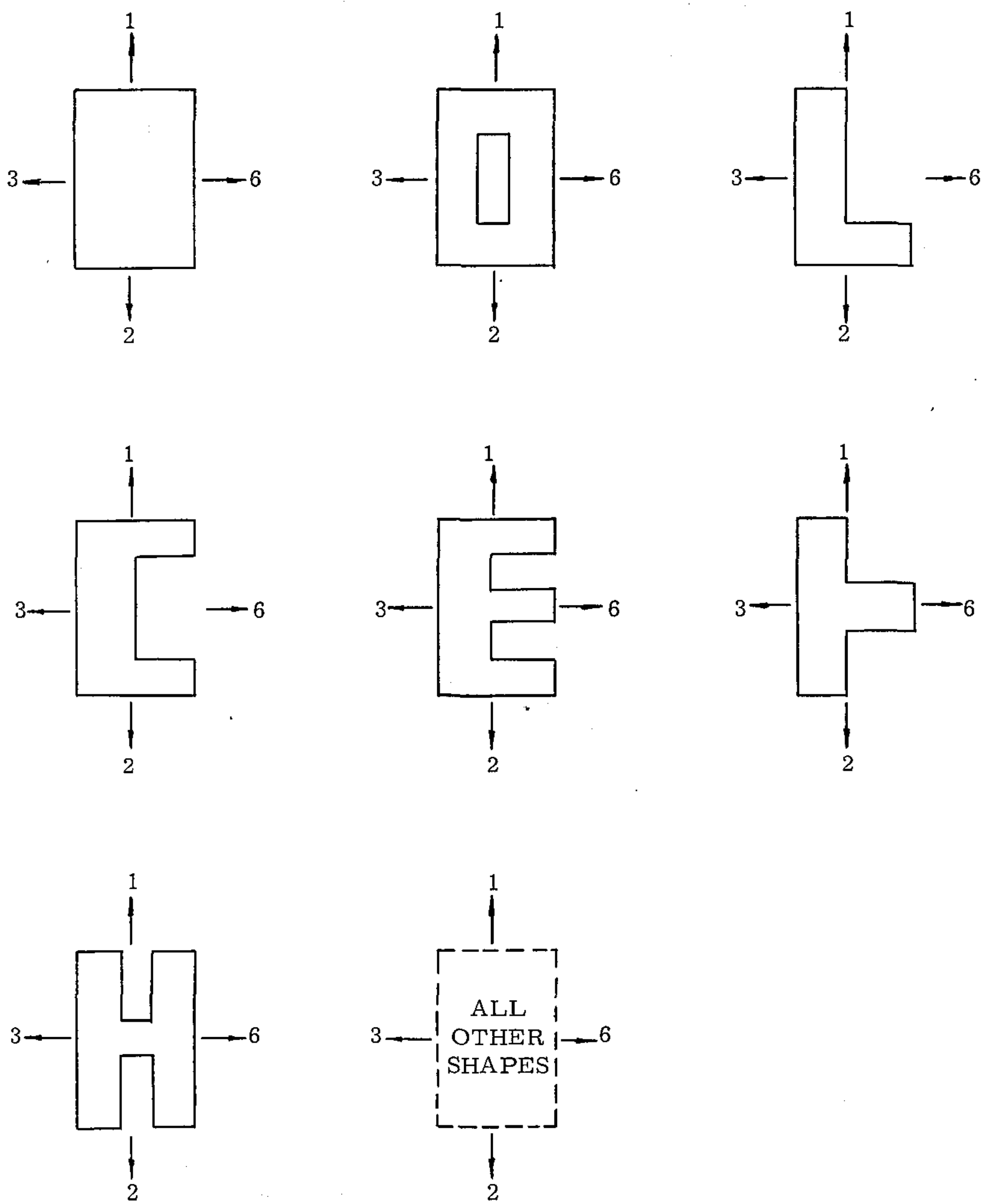
CODES FOR GENERAL BUILDING SHAPES



NOTE: Using the above general shapes, select the one which best approximates the shape of the building being considered, and enter code given opposite the shape in the appropriate card column.

FIG. 66

CODES FOR SUBJECT LOCATION ON FLOOR



NOTE: See explanation on following page.

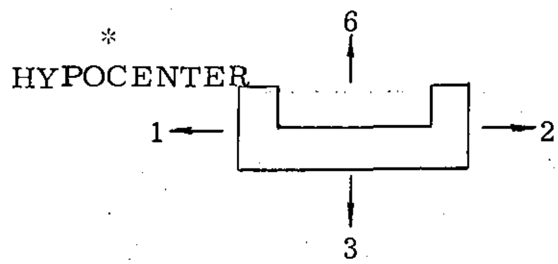
FIG. 66 (Continued)

CODES FOR SUBJECT LOCATION ON FLOOR

1st Digit (Building Orientation)

NOTE: For orientation of the building with respect to the hypocenter, select the two arrows which best approximate the direction of the hypocenter with relation to the building shape. The sum of the numbers associated with these two arrows is the code to be entered in Item 22, Column 60. If only one arrow is needed to establish the orientation of the building with respect to the hypocenter, then enter the number associated with this arrow.

Example: Arrows 1 and 6 identify the hypocenter (*). The code to be entered in Item 22, Column 60 is a 7, the result obtained by adding the numbers associated with these two arrows.



2nd Digit (Subject Orientation)

NOTE: Once the building orientation has been established by the above method, the location of the subject can then be determined. Keeping the building aligned with the hypocenter, select the two arrows that best define the orientation of the subject with respect to the building shape. The sum of the numbers associated with these two arrows is the code to be entered in Item 22, Column 61. If only one arrow is needed to establish the location of the subject, then enter the number associated with this arrow. If the subject is located in the middle of the building, enter a 9 in Item 22, Column 61.

Example: Arrows 1 and 6 define the hypocenter (*). Therefore, the two arrows that best define the location of the subject (#) with respect to the building shape and the hypocenter are arrows 3 and 2. The code to be entered in Item 22, Column 61 is a 5, the result obtained by adding the numbers associated with these arrows.

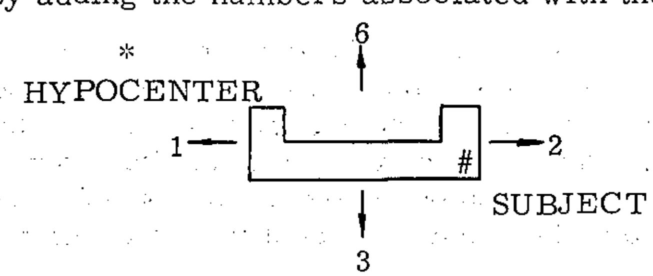
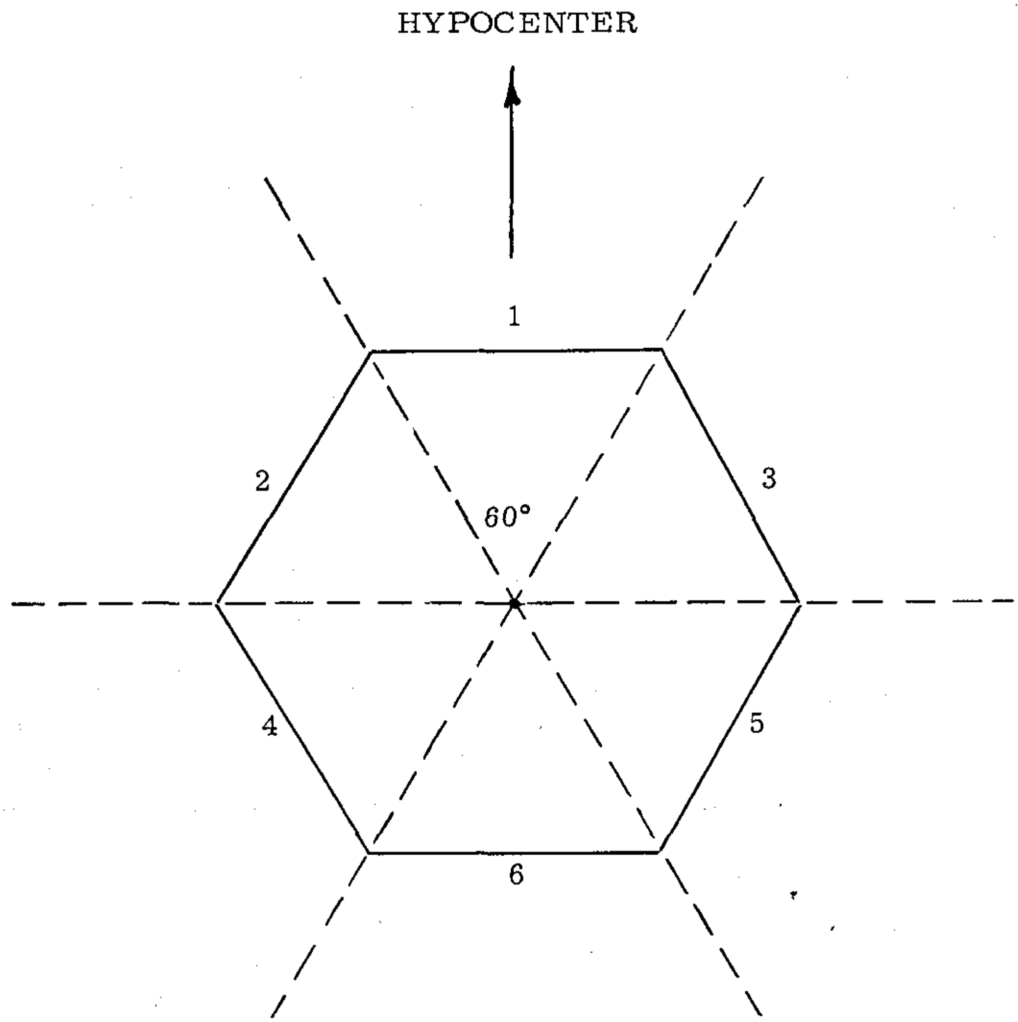


FIG. 67

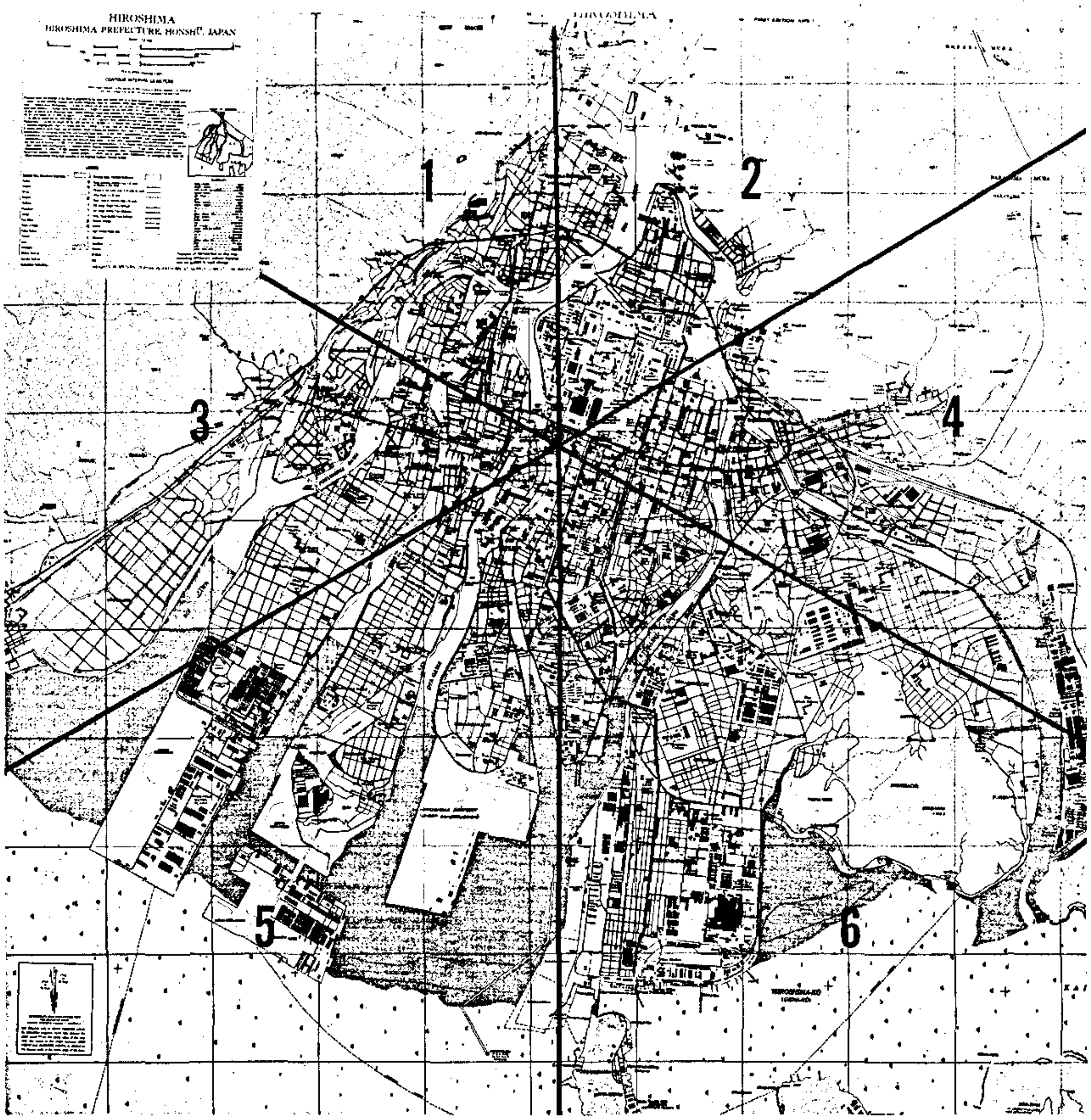
CODES FOR DIRECTION OF SHELTER OPENINGS



NOTE: Center the model over the shelter with the arrow pointing toward the hypocenter. Select the two radial lines that best define the direction of the shelter opening with respect to the orientation of the model. The number given between the two radial lines selected is the code number to be entered. In case of more than one shelter opening, code the opening nearest the hypocenter.

FIG. 68

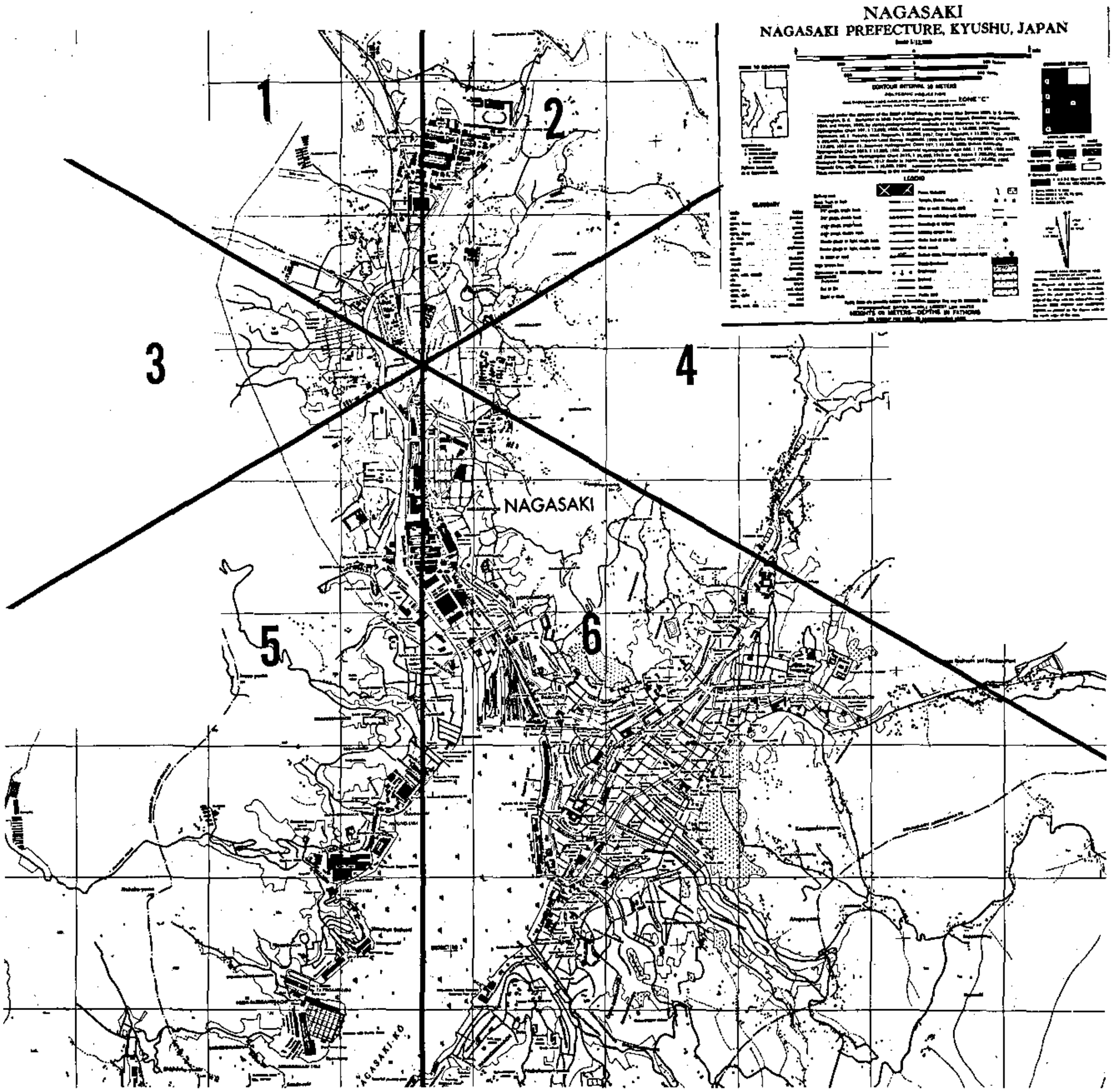
CODES FOR DIRECTION OF ESCAPE
HIROSHIMA



NOTE: Enter number which best approximates the direction of escape.

FIG. 68 (Continued)

CODES FOR DIRECTION OF ESCAPE
NAGASAKI



NOTE: Enter number which best approximates the direction of escape.

FIG. 69

SAMPLE CODE SHEET

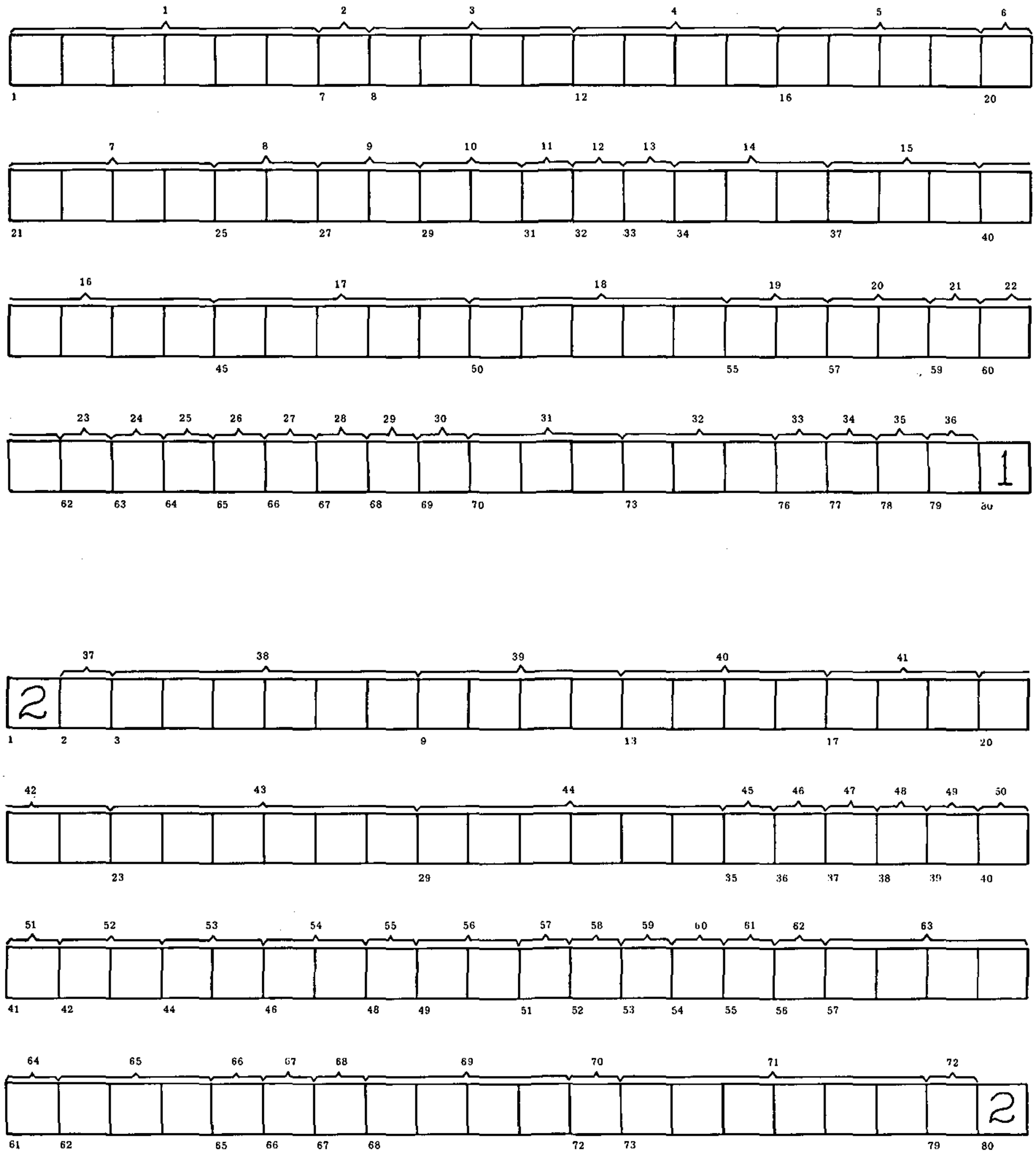
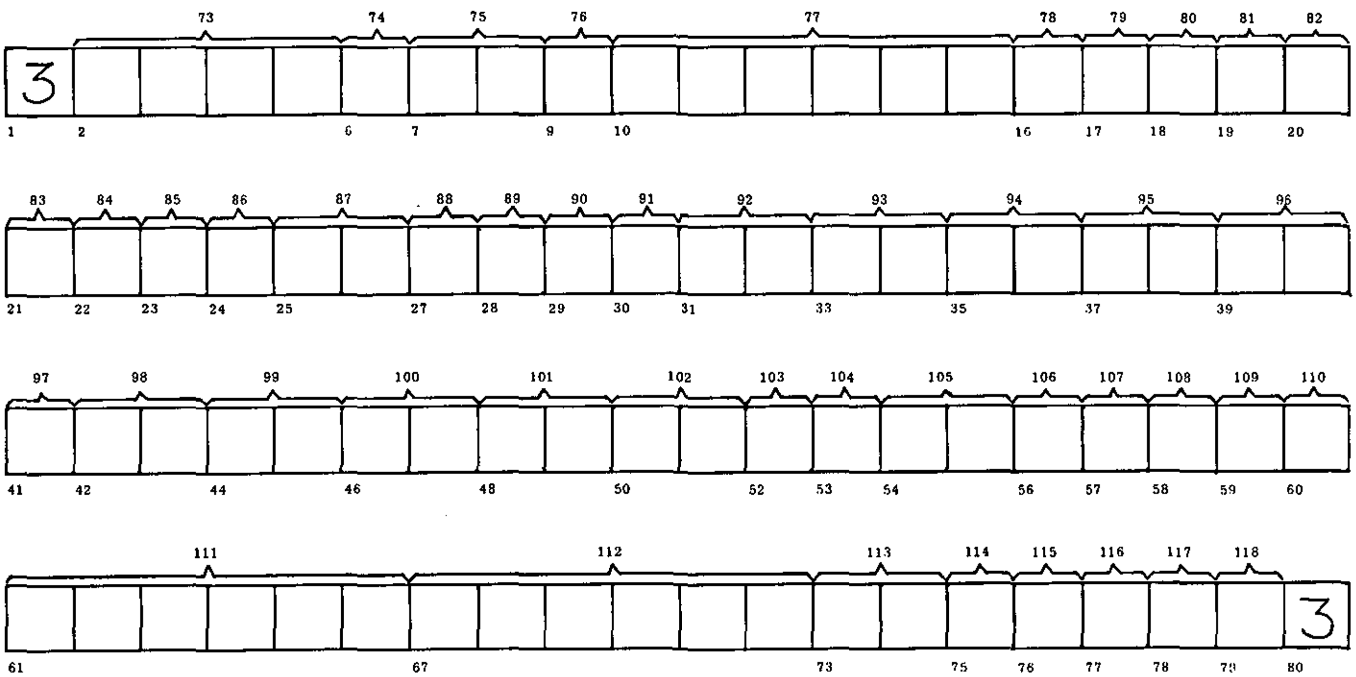


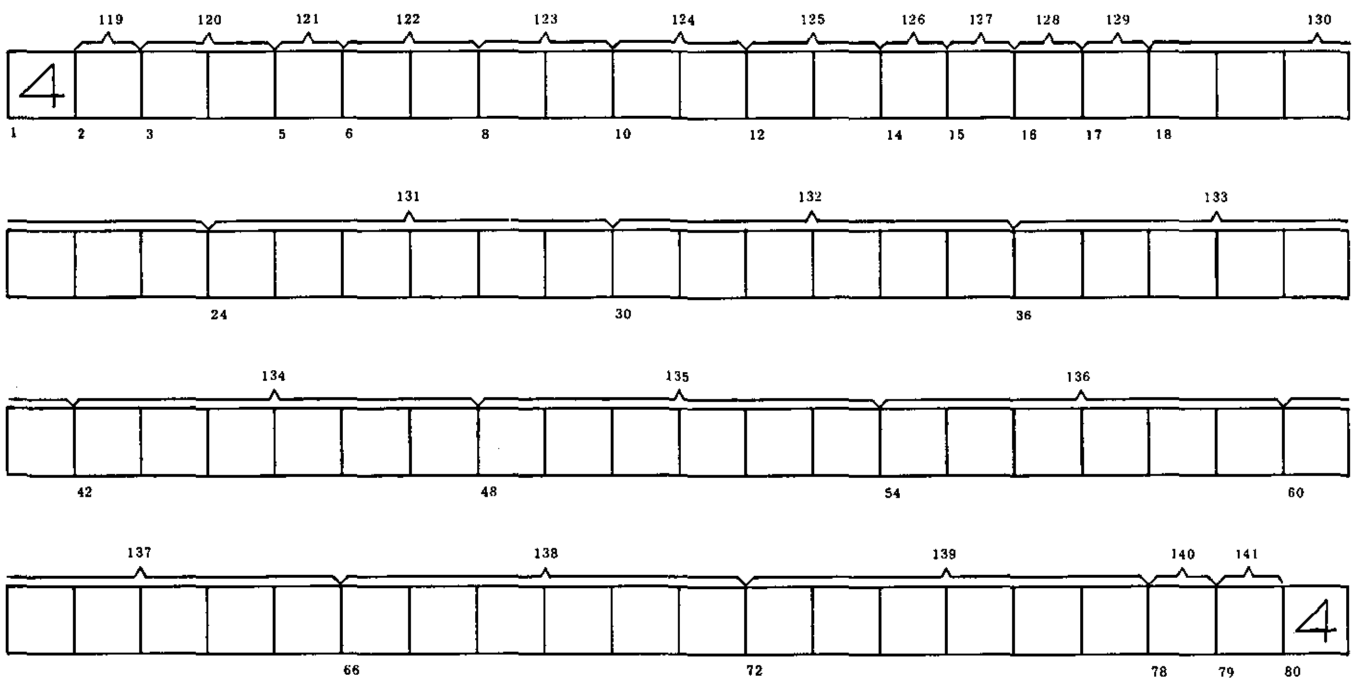
FIG. 69 (Continued)

SAMPLE CODE SHEET

CARD 3



CARD 4



CARD 5

NAME (Item 142, Column 2-30)__________

ADDRESS (Item 143, Column 31-60)__________

B-FILE CODE (Item 144, Column 61-65)__________

GLOSSARY

Abrasion	– Superficial tearing of the skin, with loss of substance in small shreds.
ATB	– At time of burst: Hiroshima (August 6, 1945-8:16 A.M.); Nagasaki (August 9, 1945-11:02 A.M.).
Ambulatory	– Able to walk; persons who are not bedridden.
Anorexia	– Want of appetite, without a loathing of food.
Autopsy	– Inspection, and usually partial dissection, of a dead body which has been opened so as to expose important organs either to ascertain the cause of death, or, if this is known, the exact nature and extent of the lesions of the disease, and any other abnormalities present.
Cataracts	– An opacity of the crystalline lens of the eye, or of its capsule, obstructing passage of the waves of light.
Compound Fracture	– The breaking of a bone or (less often) of a cartilage in which an open wound is produced through which the bone often protrudes.
Concussion	– A condition of lowered functional activity, without visible structural change, produced in an organ by a shock; as a concussion of the brain.
Contusion	– A bruise; an injury attended with more or less disorganization of the subcutaneous tissue and effusion of blood beneath the skin, but without breaking of the skin.
Dislocation	– Displacement of a bone at a joint.
Dispensary	– A place where medicines are prepared and dispensed.
Emaciation	– To lose flesh so as to become very lean.
Epilation	– To remove or eradicate hair, especially by destroying the roots.
Flash Burn	– A burn caused by excessive exposure (of bare skin) to thermal radiation.

Foetus	– The young of man in the womb, commonly restricted to the young in the later stages of development in the womb, in man often from the end of the third month until birth.
Gingivitis	– Inflammation of the gums.
Hemoglobin	– The respiratory pigment in the red corpuscles of vertebrates.
Hemorrhage	– Any discharge of blood from the blood vessels.
Hypocenter	– The point on the surface of land or water vertically above or below the center of a burst of a nuclear weapon. (Hiroshima hypocenter–744.281 kiloyards east by 1261.696 kiloyards north; Nagasaki hypocenter–1293.61 kiloyards east by 1065.92 kiloyards north.)
IAB	– Immediately after burst.
In Utero	– The time in which the female mammals contain and nourish the young during the development previous to birth.
Keloids	– Dense fibrous tumors of the skin, occurring usually at the site of an injury and consisting of an overgrowth of scar tissue.
Lacerations	– A wound made by tearing.
Leukemia	– A morbid state due to derangement of the blood making organs, and characterized by an excessive number of leucocytes in the blood.
Malaise	– An indefinite feeling of uneasiness, or of being ill.
Menopause	– The period of natural cessation of menstruation, occurring usually between the ages of forty-five and fifty.
Menstruation	– To discharge the menses (a periodic flow of blood or bodily fluid from the uterus, occurring normally every four weeks and lasting typically three to five days).
Necrotic	– Death or mortification, especially of a bodily tissue, as from loss of blood supply, corrosion, burning, etc.
Non-Ambulatory	– Not able to walk; persons who are bedridden.

Overpressure – The transient pressure, usually expressed in pounds per square inch (psi), exceeding the ambient pressure, manifested in the shock (or blast) wave from an explosion. The variation of the overpressure with time depends on the energy yield of the explosion, the distance from the point of burst, and the medium in which the weapon is detonated. The peak overpressure is the maximum value of the overpressure at a given location.

Petechiae – Small crimson, purple, or livid spots in the skin and mucous and serous membranes, caused by extravasation of blood. They occur in severe fevers, asphyxia, purpura, and other disease.

Pharyngitis – Inflammation of the pharynx (the part of the alimentary canal between the cavity of the mouth and the esophagus).

Point of Detonation – The actual point in the air or on or under the surface of land or water where the explosion takes place.

Primary Blast Effects – Effects due to variations in environmental pressure caused by explosive events. As a general rule critical pathology is most marked in the air-containing organs (the lungs, gastrointestinal tract, ear, and paranasal sinuses) and at those locations where there is the greatest variation in tissue density.

PTB – Prior to burst.

Puncture – To pierce with a pointed instrument, or the like.

Purpura – A morbid condition or disease characterized by livid spots on the skin or mucous membranes, caused by extravated blood.

Rad – A unit of absorbed dose of radiation; it represents the absorption of 100 ergs of nuclear (or ionizing) radiation per gram of the absorbing material or tissue.

RBC – Red blood count.

Secondary Blast Effects	–	Effects due to missiles that are energized by the blast overpressures and winds or by ground shock and gravity. Missiles may contain fragments of window glass, stones, pieces of building debris, or any object other than man which is set in motion by the blast wave. Injury may result from penetration of the surface wall or organs of the body or from nonpenetrating impact of the missile.
Shielding	–	Any material or obstruction which absorbs radiation and thus tends to protect personnel or materials from the effects of a nuclear explosion. A moderately thick layer of any opaque material will provide satisfactory shielding from thermal radiation, but a considerable thickness of material of high density may be needed for nuclear-radiation shielding.
Simple Fracture	–	The breaking of a bone or (less often) of a cartilage in which the skin is not broken.
Tertiary Blast Effects	–	Effects caused when the biological target is translated by the blast wave, ground shock, or gravity. Injury can occur during the accelerative phase of displacement; however, significant damage is more likely to occur during decelerative tumbling or upon impact with a stationary object.
Thermal Radiation	–	Electromagnetic radiation emitted from the fireball as a consequence of its very high temperature; it consists essentially of ultraviolet, visible, and infrared radiations.
Tinnitus	–	A ringing, whistling, or other sensation of noise, which is purely subjective.
Trimester	–	A term or period of three, or about three months.
Vertigo	–	Dizziness or swimming of the head; it may result from changes in the blood supply of the brain or from disease of the blood, eyes, ears, stomach, or other organs.
WBC	–	White blood count.

APPENDIX B

CONSTRUCTION DETAILS AND RELATED DATA FOR SPECIFIC PUBLIC BUILDINGS IN HIROSHIMA

This section contains all of the construction details and related data for specific public buildings in Hiroshima. The underlined entry in the following material is the official building name given in the data. The building number is the code assigned this building as listed in Table 9 of Appendix A. The distance listed is the calculated horizontal range in feet from the accepted hypocenter to the building. Building construction details are the combined data from the original case histories, early source data, and strategic bombing surveys. Building plans and layouts also came from these sources. These plans varied from complete and detailed architects' plans to simple room sketches.

NIPPON LIFE INSURANCE COMPANY, HIROSHIMA BRANCH

Building Number:	10
Distance:	525 feet
General Construction:	two story commercial, masonry load bearing
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	office
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	reinforced-concrete slab, 6 inches in thickness
Exterior Wall Construction:	brick, 18 inches in thickness
Exterior Wall Trim:	stone, 4 inches in thickness
Interior Wall Construction:	brick, 13 inches in thickness for major walls; wood studs for minor walls
Interior Wall Finish:	plaster
Floor Construction:	first floor, concrete slab; second floor, wood beams and flooring
Ceiling Construction:	unknown
Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

HIROSHIMA NAVAL ADMINISTRATIVE DEPARTMENT (BANKERS' CLUB)

Building Number:	11
Distance:	606 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3
Floors Below Ground:	none
Principal Building Use:	office
Percent Structural Damage:	21-40
Cause of Damage:	blast
Roof Construction:	reinforced-concrete beam and slab covered with tile, total thickness, 8 inches
Exterior Wall Construction:	reinforced concrete, 10 inches in thickness
Exterior Wall Trim:	brick tile, 1 inch in thickness
Interior Wall Construction:	reinforced concrete, 6 inches in thickness for major walls; wood studs for minor walls
Interior Wall Finish:	plaster, 4/5 inch in thickness
Floor Construction:	reinforced-concrete beam and slab
Ceiling Construction:	plaster
Window and Door Framing:	steel
Floor Plans Available:	partial set, detailed

GEIBI BANK COMPANY, HIROSHIMA BRANCH

Building Number:	18
Distance:	961 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	5
Floors Below Ground:	basement
Principal Building Use:	bank
Percent Structural Damage:	1-20
Cause of Damage:	blast
Roof Construction:	reinforced-concrete slab, metal pan

GEIBI BANK COMPANY, HIROSHIMA BRANCH
(Continued)

Exterior Wall Construction:	reinforced concrete, 10 inches in thickness
Exterior Wall Trim:	natural granite
Interior Wall Construction:	reinforced concrete, 5 inches in thickness; wood lath on wood studs in rear addition
Interior Wall Finish:	plaster
Floor Construction:	reinforced-concrete slabs, metal pan
Ceiling Construction:	plaster on concrete
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

MEIJI LIFE INSURANCE COMPANY, HIROSHIMA BRANCH

Building Number:	22
Distance:	1010 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	4
Floors Below Ground:	none
Principal Building Use:	office
Percent Structural Damage:	1-20
Cause of Damage:	blast
Roof Construction:	reinforced-concrete beam and slab
Exterior Wall Construction:	reinforced concrete, 12 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete for major walls, wood stud for minor walls
Interior Wall Finish:	plaster
Floor Construction:	unknown
Ceiling Construction:	plaster on metal lath on wood hangers
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

FUKOKU BUILDING

Building Number:	23
Distance:	1078 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	7
Floors Below Ground:	basement
Principal Building Use:	department store
Percent Structural Damage:	1-20
Cause of Damage:	blast
Roof Construction:	reinforced-concrete beam and slab, steel core
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	stone
Interior Wall Construction:	reinforced concrete
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete, wood finish
Ceiling Construction:	metal lath and plaster
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

BANK OF JAPAN, HIROSHIMA BRANCH

Building Number:	24
Distance:	1278 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3
Floors Below Ground:	basement
Principal Building Use:	bank
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete beam and slab with a cement tile finish and a surface layer of sand 20 inches in thickness
Exterior Wall Construction:	reinforced concrete, 12 inches in thickness

BANK OF JAPAN, HIROSHIMA BRANCH
(Continued)

Exterior Wall Trim:	natural block granite
Interior Wall Construction:	reinforced concrete, wood lath, or light steel frame, 6 inches in thickness
Interior Wall Finish:	plaster
Floor Construction:	reinforced concrete, 6 inches in thickness
Ceiling Construction:	plaster on concrete
Window and Door Framing:	metal exterior, wood interior
Floor Plans Available:	partial set for third floor, detailed

CHUGOKU ELECTRIC COMPANY

Building Number:	26
Distance:	2215 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	5
Floors Below Ground:	basement
Principal Building Use:	office
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete beam and slab
Exterior Wall Construction:	reinforced concrete, 12 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete, 6 inches in thickness
Interior Wall Finish:	unknown
Floor Construction:	reinforced-concrete slab on first and second floors; parquet wood surface on third, fourth, fifth, and sixth floors
Ceiling Construction:	unknown

CHUGOKU ELECTRIC COMPANY
(Continued)

Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

HIROSHIMA CITY HALL

Building Number:	28
Distance:	3288 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	4
Floors Below Ground:	basement
Principal Building Use:	office
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced concrete, 11 inches in thickness; tile surface, 1 inch in thick-ness
Exterior Wall Construction:	reinforced concrete, 10 inches in thickness
Exterior Wall Trim:	imitation granite, 1/2 inch in thickness
Interior Wall Construction:	reinforced concrete, 5 inches in thickness and tile, wood wainscot in stair halls
Interior Wall Finish:	plaster, 3/4 inch in thickness
Floor Construction:	reinforced concrete, cement finish
Ceiling Construction:	plaster
Window and Door Framing:	metal
Floor Plans Available:	full set, part of third floor detailed

JAPAN RED CROSS HOSPITAL

Building Number:	31

JAPAN RED CROSS HOSPITAL
(Continued)

Distance:	4850 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	3
Floors Below Ground:	basement
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab, tile finish
Exterior Wall Construction:	reinforced concrete, 10 inches in thickness
Exterior Wall Trim:	smooth, hard-glazed tile in main building; semi-smooth cement in two wings
Interior Wall Construction:	reinforced concrete for major walls; wood lath on wood studs for minor walls
Interior Wall Finish:	lath and plaster, 2/5 inch in thickness; tile in several rooms
Floor Construction:	reinforced concrete
Ceiling Construction:	plaster on wood lath, thin coating of "Cello-Tex"
Window and Door Framing:	metal exterior, wood interior
Floor Plans Available:	full set, part of first floor detailed

HIROSHIMA UNIVERSITY OF LITERATURE AND SCIENCE

Building Number:	33
Distance:	4760 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant

HIROSHIMA UNIVERSITY OF LITERATURE AND SCIENCE
(Continued)

Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	auditorium, library, etc.
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab and beams
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	brick tile veneer
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced-concrete beam and slab
Ceiling Construction:	plaster on concrete
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

HIROSHIMA UNIVERSITY OF LITERATURE AND SCIENCE

Building Number:	34
Distance:	4820 feet
General Construction:	three-story commercial, masonry load bearing
Floors Above Ground:	3
Floors Below Ground:	none
Principal Building Use:	auditorium, library, etc.
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	tile over wood sheathing, purlins, and beams
Exterior Wall Construction:	load-bearing brick; 2. 5 bricks thick on first floor, 2 bricks thick on second and third floors
Exterior Wall Trim:	brick
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	wood on wood framing
Ceiling Construction:	unknown

HIROSHIMA UNIVERSITY OF LITERATURE AND SCIENCE (Continued)

Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

HIROSHIMA UNIVERSITY OF LITERATURE AND SCIENCE

Building Number:	39
Distance:	4840 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	university
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced concrete
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	brick tile veneer
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete, wood finish
Ceiling Construction:	wood lath and plaster
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

HIROSHIMA POSTAL SAVINGS BUREAU

Building Number:	40
Distance:	5000 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	4
Floors Below Ground:	basement
Principal Building Use:	office
Percent Structural Damage:	none

HIROSHIMA POSTAL SAVINGS BUREAU
(Continued)

Cause of Damage:	none
Roof Construction:	reinforced concrete, tile finish
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	tile
Interior Wall Construction:	reinforced concrete
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	plaster on concrete on first and second floors; plaster on wood lath on third floor
Window and Door Framing:	metal exterior, wood interior
Floor Plans Available:	partial set, not detailed

FUKUYA DEPARTMENT STORE

Building Number:	47
Distance:	2398 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	8
Floors Below Ground:	basement
Principal Building Use:	department store
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete beam and slab, steel trusses over theater
Exterior Wall Construction:	reinforced concrete, 8 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	metal lath
Interior Wall Finish:	plaster
Floor Construction:	wood over reinforced concrete
Ceiling Construction:	plaster on concrete

FUKUYA DEPARTMENT STORE
(Continued)

Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

FUKUROMACHI GRAMMAR SCHOOL

Building Number:	48
Distance:	1650 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	3
Floors Below Ground:	basement
Principal Building Use:	school
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete beam and slab
Exterior Wall Construction:	reinforced concrete, 6 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete, 6 inches in thickness
Interior Wall Finish:	unknown
Floor Construction:	wood on sleepers over reinforced-concrete beam and slab
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

HIROSHIMA TELEPHONE COMPANY

Building Number:	50
Distance:	1795 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant

HIROSHIMA TELEPHONE COMPANY
(Continued)

Floors Above Ground:	3
Floors Below Ground:	none
Principal Building Use:	telephone exchange
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete beam and slab
Exterior Wall Construction:	reinforced concrete, 10 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete, 7 inches in thickness
Interior Wall Finish:	plaster or smooth cement
Floor Construction:	wood on concrete, parquet; reinforced-concrete beam and slab
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, detailed

CHUGOKU NEWSPAPER

Building Number:	56
Distance:	3780 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	8
Floors Below Ground:	none
Principal Building Use:	office
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete beam and slab
Exterior Wall Construction:	reinforced concrete, 7 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete
Interior Wall Finish:	plaster

CHUGOKU NEWSPAPER
(Continued)

Floor Construction:	reinforced-concrete beam and slab, 6 inches in thickness; small part has wood overlay
Ceiling Construction:	plaster
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

HYPOTHEC BANK OF JAPAN, HIROSHIMA BRANCH

Building Number:	58
Distance:	3095 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3
Floors Below Ground:	basement
Principal Building Use:	bank
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete beam and slab
Exterior Wall Construction:	reinforced concrete, 7 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete, 7 inches in thickness on major walls; metal lath on minor walls
Interior Wall Finish:	plaster
Floor Construction:	parquet on reinforced-concrete beam and slab
Ceiling Construction:	plaster on concrete
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

SANYO MIDDLE SCHOOL

Building Number:	63

SANYO MIDDLE SCHOOL
(Continued)

Distance:	3725 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	auditorium, library, etc.
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	sheet steel over steel purlins and trusses
Exterior Wall Construction:	sheet steel and glass
Exterior Wall Trim:	sheet steel
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

TAKEYA GRAMMAR SCHOOL

Building Number:	64
Distance:	4220 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	auditorium, library, etc.
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	asbestos slate and wood over wood purlins, steel trusses
Exterior Wall Construction:	wood studs
Exterior Wall Trim:	asbestos slate
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown

TAKEYA GRAMMAR SCHOOL
(Continued)

Floor Construction:	wood on concrete piers
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	partial set, not detailed

HIROSHIMA RADIO STATION (JOFK)

Building Number:	68
Distance:	3350 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	2 and penthouse
Floors Below Ground:	none
Principal Building Use:	government
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete beam and slab
Exterior Wall Construction:	reinforced concrete, 8 inches in thickness
Exterior Wall Trim:	plaster and imitation granite
Interior Wall Construction:	reinforced concrete, 4 inches in thickness
Interior Wall Finish:	plaster and imitation granite
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	full set, not detailed

HIROSHIMA COMMUNICATIONS HOSPITAL

Building Number:	71
Distance:	4960 feet

HIROSHIMA COMMUNICATIONS HOSPITAL
(Continued)

General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	2
Floors Below Ground:	basement
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete beam and slab
Exterior Wall Construction:	reinforced concrete, 8.5 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath on wood studs
Interior Wall Finish:	plaster
Floor Construction:	reinforced-concrete beam and slab
Ceiling Construction:	plaster on concrete
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

HIROSHIMA DEPARTMENT OF COMMUNICATIONS

Building Number:	72
Distance:	4850 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	4
Floors Below Ground:	none
Principal Building Use:	office
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete beam and slab
Exterior Wall Construction:	reinforced concrete, 10 inches in thickness
Exterior Wall Trim:	unknown

HIROSHIMA DEPARTMENT OF COMMUNICATIONS
(Continued)

Interior Wall Construction:	reinforced concrete or wood, 4 inches in thickness
Interior Wall Finish:	plaster
Floor Construction:	reinforced-concrete beam and slab, monolithic finish
Ceiling Construction:	plaster on concrete
Window and Door Framing:	steel
Floor Plans Available:	full set, partially detailed

HIROSHIMA RAILWAY BUREAU, YOKOGAWA AUTOMOBILE GARAGE

Building Number:	87
Distance:	6020 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	garage or service station
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	corrugated asbestos and corrugated iron on steel purlins, rails
Exterior Wall Construction:	metal frame
Exterior Wall Trim:	corrugated iron sheeting
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete on earth
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

MISASA GRAMMAR SCHOOL

Building Number:	89

MISASA GRAMMAR SCHOOL
(Continued)

Distance:	6530 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	auditorium, library, etc.
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	slate on wood over steel trusses
Exterior Wall Construction:	metal frame
Exterior Wall Trim:	cement stucco, 2 inches in thickness on metal lath
Interior Wall Construction:	unknown
Interior Wall Finish:	wood
Floor Construction:	wood on wood beams and concrete posts
Ceiling Construction:	exposed ceiling
Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

KEITOKU CAST METAL FACTORY

Building Number:	92
Distance:	5945 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	21-40
Cause of Damage:	blast
Roof Construction:	slate on wood lath and purlins
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	plaster on bamboo lath
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown

KEITOKU CAST METAL FACTORY
(Continued)

Floor Construction:	earth
Ceiling Construction:	unknown
Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

SUMINO INDUSTRIES

Building Number:	93
Distance:	5390 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	corrugated asbestos
Exterior Wall Construction:	masonry, 6 inches in thickness; brick, 8 inches in thickness, corrugated asbestos above 4.5 feet
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete on earth
Ceiling Construction:	unknown
Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

HIROSHIMA TELEPHONE COMPANY, DIAL EXCHANGE

Building Number:	97
Distance:	3410 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant

HIROSHIMA TELEPHONE COMPANY, DIAL EXCHANGE
(Continued)

Floors Above Ground:	3
Floors Below Ground:	none
Principal Building Use:	telephone exchange
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete beam and slab
Exterior Wall Construction:	reinforced concrete, 10 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete, 8 inches in thickness for major walls, wood studs and wood lath for minor walls
Interior Wall Finish:	plaster
Floor Construction:	reinforced concrete, cement finish
Ceiling Construction:	unknown
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

KOKO PRIVATE GRAMMAR SCHOOL

Building Number:	98
Distance:	2025 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete, 8-10 inches in thickness
Exterior Wall Trim:	unknown

KOKO PRIVATE GRAMMAR SCHOOL
(Continued)

Interior Wall Construction:	brick, 9 inches in thickness; reinforced concrete, 6 inches in thickness
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete, wood finish on sleepers
Ceiling Construction:	wood lath and plaster
Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

MITSUBISHI SHIPBUILDING COMPANY, HIROSHIMA BRANCH

Building Number:	104
Distance:	unknown
General Construction:	unknown
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	unknown
Cause of Damage:	unknown
Roof Construction:	unknown
Exterior Wall Construction:	unknown
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	unknown
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	partial set, not detailed

HONKAWA GRAMMAR SCHOOL

Building Number:	108
Distance:	1262 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3

HONKAWA GRAMMAR SCHOOL
(Continued)

Floors Below Ground:	basement
Principal Building Use:	school
Percent Structural Damage:	1-20
Cause of Damage:	blast
Roof Construction:	reinforced concrete, cement finish
Exterior Wall Construction:	reinforced concrete, 10 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete, 7 inches in thickness
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete, wood finish on sleepers
Ceiling Construction:	plaster on concrete
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

TOYO BOILER COMPANY, HIROSHIMA FACTORY

Building Number:	116
Distance:	4860 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	21-40
Cause of Damage:	blast
Roof Construction:	corrugated asbestos, wood sheathing and trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	plaster inside, stucco outside; both on wood lath
Interior Wall Construction:	concrete
Interior Wall Finish:	plaster, 4 feet high
Floor Construction:	concrete
Ceiling Construction:	unknown

TOYO BOILER COMPANY, HIROSHIMA FACTORY
(Continued)

Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

HIROSHIMA MUNICIPAL MIDDLE SCHOOL

Building Number:	120
Distance:	5144 feet
General Construction:	single-story industrial, very light steel frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	auditorium, library, etc.
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	tile on paper, wood boards, wood purlins and steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	plaster on bamboo
Interior Wall Construction:	unknown
Interior Wall Finish:	plaster on bamboo
Floor Construction:	wood on concrete posts
Ceiling Construction:	unknown
Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

TEMMA GRAMMAR SCHOOL

Building Number:	123
Distance:	3845 feet
General Construction:	single-story industrial, very light steel frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	auditorium, library, etc.
Percent Structural Damage:	81-100
Cause of Damage:	blast

TEMMA GRAMMAR SCHOOL
(Continued)

Roof Construction:	cement, asbestos tile over wood sheathing and purlins, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	plaster on wood lath
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	wood on wood beams over concrete posts
Ceiling Construction:	unknown
Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

HIROSHIMA PREFECTURE, DAINI MIDDLE SCHOOL

Building Number:	124
Distance:	6040 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	cement-asbestos tile, wood boards and purlins
Exterior Wall Construction:	reinforced concrete and concrete block, 16 by 16 inches
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood frame
Interior Wall Finish:	plaster on wood lath
Floor Construction:	wood
Ceiling Construction:	wood lath and plaster
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

HIROSHIMA RAILWAY STATION

Building Number:	152
Distance:	6235 feet
General Construction:	multistory commercial, conventional design, reinforced concrete
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	railroad and streetcar station
Percent Structural Damage:	61-80
Cause of Damage:	blast and fire
Roof Construction:	reinforced (expanded metal) concrete over steel trusses
Exterior Wall Construction:	brick panel, 9 inches in thickness
Exterior Wall Trim:	brick
Interior Wall Construction:	unknown
Interior Wall Finish:	plaster on metal lath
Floor Construction:	concrete for first floor; wood on wood joists for second floor
Ceiling Construction:	unknown
Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

SUMITOMO BANK COMPANY, HIGASHI MATSURARA BRANCH

Building Number:	153
Distance:	6335 feet
General Construction:	multistory commercial, conventional design, reinforced concrete
Floors Above Ground:	2
Floors Below Ground:	basement
Principal Building Use:	bank
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab on steel beams
Exterior Wall Construction:	brick panel, 13 inches in thickness

SUMITOMO BANK COMPANY, HIGASHI MATSURARA BRANCH
(Continued)

Exterior Wall Trim:	brick
Interior Wall Construction:	unknown
Interior Wall Finish:	plaster on metal lath
Floor Construction:	reinforced-concrete slab and beams
Ceiling Construction:	plaster on concrete
Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

TOYO TEXTILE MILL

Building Number:	155
Distance:	7260 feet
General Construction:	single-story commercial, masonry load bearing
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	1-20
Cause of Damage:	blast
Roof Construction:	tile over wood and wood trusses and purlins
Exterior Wall Construction:	brick, load bearing, 13 inches in thickness
Exterior Wall Trim:	brick
Interior Wall Construction:	brick fire walls, 13 inches in thickness
Interior Wall Finish:	unknown
Floor Construction:	wood on concrete
Ceiling Construction:	unknown
Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

CHUGOKU ELECTRIC COMPANY, MINAMI SENDAMACHI SUBSTATION

Building Number:	167
Distance:	7760 feet

CHUGOKU ELECTRIC COMPANY, MINAMI SENDAMACHI SUBSTATION (Continued)

General Construction:	single-story commercial, masonry load bearing
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	utility (electricity)
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	asbestos tile on wood purlins and steel trusses
Exterior Wall Construction:	brick, load bearing, 26 inches in thickness
Exterior Wall Trim:	brick
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	earth
Ceiling Construction:	unknown
Window and Door Framing:	wood
Floor Plans Available:	partial set, not detailed

KOMITSU FACTORY

Building Number:	500
Distance:	5700 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	unknown
Exterior Wall Construction:	unknown
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	unknown
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	none

HOMARE FACTORY

Building Number:	501
Distance:	4800 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	unknown
Exterior Wall Construction:	unknown
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	unknown
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	none

OHASHI FACTORY

Building Number:	502
Distance:	5700 feet
General Construction:	multistory industrial, wood frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	unknown
Exterior Wall Construction:	unknown
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	unknown
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	none

HIROSHIMA POLICE SCHOOL

Building Number:	503
Distance:	3075 feet
General Construction:	multistory commercial, wood frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	unknown
Exterior Wall Construction:	unknown
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	unknown
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	full set, not detailed

PREFECTURAL AGRICULTURAL OFFICE

Building Number:	504
Distance:	3900 feet
General Construction:	multistory commercial, wood frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	government
Percent Structural Damage:	unknown
Cause of Damage:	blast
Roof Construction:	unknown
Exterior Wall Construction:	unknown
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	unknown
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	none

HIROSHIMA PRISON

Building Number:	505
Distance:	6900 feet
General Construction:	single-story commercial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	prison
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	unknown
Exterior Wall Construction:	unknown
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	unknown
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	none

UNDERGROUND COMMUNICATIONS CENTER

Building Number:	506
Distance:	2541 feet
General Construction:	heavy reinforced concrete
Floors Above Ground:	none
Floors Below Ground:	shelter
Principal Building Use:	government
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced concrete, 27 inches in thickness with a layer of gravel, 13 inches in thickness and a layer of earth, 48 inches in thickness
Exterior Wall Construction:	reinforced concrete, 18 inches in thickness
Exterior Wall Trim:	none
Interior Wall Construction:	reinforced concrete
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete

UNDERGROUND COMMUNICATIONS CENTER
(Continued)

Ceiling Construction:	reinforced concrete
Window and Door Framing:	light steel over wood, 6 inches in thickness
Floor Plans Available:	full set, detailed

APPENDIX C

CONSTRUCTION DETAILS AND RELATED DATA FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

This section contains all of the construction details and related data for specific public buildings in Nagasaki. The underlined entry in the following material is the official building name given in the data. The building number is the code assigned this building as listed in Table 9 of Appendix A. The distance listed is the calculated horizontal range in feet from the accepted hypocenter to the building. Building construction details are the combined data from the original case histories, early source data, and strategic bombing surveys. Building plans and layouts also came from these sources. These plans varied from complete and detailed architects' plans to simple room sketches.

<u>MITSUBISHI TORPEDO WORKS (MODEL TESTING)</u>

Building Number:	200
Distance:	5310 feet
General Construction:	single-story industrial, composite framed (concrete framed with structural steel trusses), cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	41-60
Cause of Damage:	blast
Roof Construction:	corrugated asbestos, steel trusses
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	wood
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (MACHINE SHOP)

Building Number:	201
Distance:	5280 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	corrugated asbestos, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated iron
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete on earth
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (OFFICES)

Building Number:	202
Distance:	5320 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3
Floors Below Ground:	basement
Principal Building Use:	office
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced concrete
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath on wood studs
Interior Wall Finish:	plaster
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown

MITSUBISHI TORPEDO WORKS (OFFICES)
(Continued)

Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (TORPEDO ASSEMBLY)

Building Number:	203
Distance:	5070 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	61-80
Cause of Damage:	blast
Roof Construction:	corrugated asbestos, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (STEEL PRESSING)

Building Number:	204
Distance:	4875 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100

MITSUBISHI TORPEDO WORKS (STEEL PRESSING)
(Continued)

Cause of Damage:	blast
Roof Construction:	corrugated asbestos, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (SMELTING)

Building Number:	205
Distance:	4375 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated asbestos, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (GAS GENERATORS)

Building Number:	207

MITSUBISHI TORPEDO WORKS (GAS GENERATORS)
(Continued)

Distance:	4940 feet
General Construction:	multistory industrial, light steel frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	corrugated asbestos, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (GAS GENERATORS)

Building Number:	208
Distance:	4955 feet
General Construction:	multistory industrial, light steel frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	corrugated asbestos, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (WASH ROOM)

Building Number:	209
Distance:	4980 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated asbestos, wood trusses
Exterior Wall Construction:	wood lath on wood studs
Exterior Wall Trim:	plaster
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (PARTS STORAGE)

Building Number:	210
Distance:	4860 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	warehouse
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated asbestos, wood trusses
Exterior Wall Construction:	light steel frame above 3-foot concrete walls
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown

MITSUBISHI TORPEDO WORKS (PARTS STORAGE)
(Continued)

Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (SHOP)

Building Number:	211
Distance:	4855 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	wood, wood trusses
Exterior Wall Construction:	wood
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (MACHINE SHOP)

Building Number:	212
Distance:	4550 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	corrugated asbestos, steel trusses

MITSUBISHI TORPEDO WORKS (MACHINE SHOP)
(Continued)

Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (BOILER HOUSE)

Building Number:	213
Distance:	4370 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	61-80
Cause of Damage:	blast
Roof Construction:	corrugated asbestos, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (SWITCHING STATION)

Building Number:	214
Distance:	4285 feet

MITSUBISHI TORPEDO WORKS (SWITCHING STATION)
(Continued)

General Construction:	single-story industrial, very-light-frame reinforced concrete
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced concrete, reinforced-concrete beams and girders
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (AUTO REPAIR)

Building Number:	215
Distance:	4305 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	61-80
Cause of Damage:	blast
Roof Construction:	corrugated asbestos, wood trusses
Exterior Wall Construction:	wood lath on wood studs
Exterior Wall Trim:	plaster
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete

MITSUBISHI TORPEDO WORKS (AUTO REPAIR)
(Continued)

Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (PATTERN AND MACHINE SHOP)

Building Number:	216
Distance:	5310 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated asbestos, wood trusses
Exterior Wall Construction:	wood studs
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	earth
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (CEMENT STORAGE)

Building Number:	217
Distance:	5215 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	warehouse
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire

MITSUBISHI TORPEDO WORKS (CEMENT STORAGE)
(Continued)

Roof Construction:	wood, wood trusses
Exterior Wall Construction:	wood studs
Exterior Wall Trim:	wood siding
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	earth
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (STORAGE)

Building Number:	218
Distance:	5140 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	warehouse
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	wood and tile, wood trusses
Exterior Wall Construction:	wood studs
Exterior Wall Trim:	wood siding
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (OIL STORAGE)

Building Number:	219
Distance:	5185 feet

MITSUBISHI TORPEDO WORKS (OIL STORAGE)
(Continued)

General Construction:	single-story industrial, very light reinforced-concrete frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	warehouse
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced concrete, 8 inches in thickness
Exterior Wall Construction:	reinforced concrete, 7 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (OIL STORAGE)

Building Number:	220
Distance:	5300 feet
General Construction:	single-story industrial, composite frame (concrete frame with structural steel trusses) with 10-50 ton cranes
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	warehouse
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	corrugated asbestos, steel trusses
Exterior Wall Construction:	reinforced concrete, 12 inches in thickness
Exterior Wall Trim:	unknown

MITSUBISHI TORPEDO WORKS (OIL STORAGE)
(Continued)

Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (MACHINE SHOP)

Building Number:	221
Distance:	4950 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated asbestos, wood purlins, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (MACHINE SHOP)

Building Number:	222
Distance:	4750 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons

MITSUBISHI TORPEDO WORKS (MACHINE SHOP)
(Continued)

Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated asbestos on wood, steel trusses
Exterior Wall Construction:	light steel and wood frame
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (MACHINING AND ASSEMBLY)

Building Number:	223
Distance:	4420 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated asbestos on wood sheathing, steel trusses
Exterior Wall Construction:	light steel and wood frame
Exterior Wall Trim:	corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (ASSEMBLY)

Building Number:	224
Distance:	4110 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated asbestos on wood sheathing and purlins, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated asbestos on wood nailers
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (SHOPS)

Building Number:	225
Distance:	4110 feet
General Construction:	single-story industrial, composite frame (concrete frame with structural steel trusses)
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	21-40
Cause of Damage:	blast
Roof Construction:	corrugated asbestos and reinforced concrete, steel trusses

MITSUBISHI TORPEDO WORKS (SHOPS)
(Continued)

Exterior Wall Construction:	reinforced concrete, 7 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete, 7 inches in thickness
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (OFFICES AND DRAFTING)

Building Number:	226
Distance:	4110 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	office
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated asbestos on wood sheathing and purlins, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated asbestos on wood nailers
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (SHOP AND LABORATORY)

Building Number:	227

MITSUBISHI TORPEDO WORKS (SHOP AND LABORATORY) (Continued)

Distance:	4110 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	wood and tile, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	wood siding
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (OFFICES)

Building Number:	228
Distance:	4110 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	office
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	tile on wood, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	wood siding
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	wood
Ceiling Construction:	unknown

MITSUBISHI TORPEDO WORKS (OFFICES)
(Continued)

Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (OFFICES AND LABORATORIES)

Building Number:	229
Distance:	4110 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	3
Floors Below Ground:	basement
Principal Building Use:	office
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced concrete
Exterior Wall Construction:	reinforced concrete, 6.5 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete and wood
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (OFFICES)

Building Number:	230
Distance:	3780 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	office
Percent Structural Damage:	81-100

MITSUBISHI TORPEDO WORKS (OFFICES)
(Continued)

Cause of Damage:	blast
Roof Construction:	tile on wood, wood trusses
Exterior Wall Construction:	lath on wood frame
Exterior Wall Trim:	stucco
Interior Wall Construction:	lath on wood studs
Interior Wall Finish:	plaster
Floor Construction:	wood
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (OFFICES)

Building Number:	232
Distance:	3690 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	office
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	tile on wood, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	stucco
Interior Wall Construction:	wood studs
Interior Wall Finish:	plaster
Floor Construction:	wood
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (STORAGE)

Building Number:	233

MITSUBISHI TORPEDO WORKS (STORAGE)
(Continued)

Distance:	4530 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	warehouse
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	tile on wood, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	wood siding
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete for first floor; wood for second floor
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TORPEDO WORKS (SHOP)

Building Number:	235
Distance:	4350 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated asbestos on wood purlins, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated asbestos on wood nailers
Interior Wall Construction:	unknown

MITSUBISHI TORPEDO WORKS (SHOP)
(Continued)

Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (FOUNDRY)

Building Number:	243
Distance:	2375 feet
General Construction:	multistory industrial, light steel frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	corrugated iron, trusses 1/3 wood and 2/3 steel
Exterior Wall Construction:	steel frame
Exterior Wall Trim:	corrugated iron
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete on first floor; steel on second floor
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (FOUNDRY)

Building Number:	251
Distance:	2970 feet
General Construction:	single-story industrial, steel frame, 10-25 ton cranes

MITSUBISHI STEEL AND ARMS PLANT (FOUNDRY)
(Continued)

Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated iron, steel trusses
Exterior Wall Construction:	steel frame
Exterior Wall Trim:	corrugated iron and corrugated asbestos
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete and earth
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (FOUNDRY)

Building Number:	253
Distance:	3180 feet
General Construction:	single-story industrial, steel frame, 10-25 ton cranes
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated iron, steel trusses
Exterior Wall Construction:	steel frame
Exterior Wall Trim:	corrugated iron
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete, 5-6 inches in thickness, on earth
Ceiling Construction:	unknown

MITSUBISHI STEEL AND ARMS PLANT (FOUNDRY)
(Continued)

Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (STORAGE-CASTINGS)

Building Number:	255
Distance:	3300 feet
General Construction:	single-story industrial, steel frame, 10-25 ton cranes
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	corrugated iron, steel trusses
Exterior Wall Construction:	steel frame
Exterior Wall Trim:	corrugated iron
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete, 5-6 inches in thickness, on earth
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (PATTERN SHOP AND FOUNDRY)

Building Number:	258
Distance:	3540 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing

MITSUBISHI STEEL AND ARMS PLANT (PATTERN SHOP AND FOUNDRY) (Continued)

Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated iron, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated iron
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete, 5-6 inches in thickness, on earth
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (OFFICES)

Building Number:	259
Distance:	3540 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3
Floors Below Ground:	basement
Principal Building Use:	office
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced concrete
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath on wood studs
Interior Wall Finish:	plaster
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (ANNEALING AND CASTING)

Building Number:	260
Distance:	3810 feet
General Construction:	single-story industrial, steel frame, 10-25 ton cranes
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	61-80
Cause of Damage:	blast
Roof Construction:	corrugated iron, steel trusses
Exterior Wall Construction:	steel frame
Exterior Wall Trim:	corrugated iron
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (BOILERS)

Building Number:	262
Distance:	3960 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	basement
Principal Building Use:	manufacturing
Percent Structural Damage:	41-60
Cause of Damage:	blast
Roof Construction:	corrugated iron, steel trusses
Exterior Wall Construction:	light steel frame
Exterior Wall Trim:	corrugated iron
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete

MITSUBISHI STEEL AND ARMS PLANT (BOILERS)
(Continued)

Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (OFFICE AND LABORATORY)

Building Number:	264
Distance:	3930 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	office
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced concrete
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath
Interior Wall Finish:	plaster
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (HEAT TREATMENT)

Building Number:	266
Distance:	4020 feet
General Construction:	single-story industrial, steel frame, 10-25 ton cranes
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	1-20

MITSUBISHI STEEL AND ARMS PLANT (HEAT TREATMENT) (Continued)

Cause of Damage:	blast
Roof Construction:	corrugated iron, steel trusses
Exterior Wall Construction:	steel frame
Exterior Wall Trim:	corrugated iron
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	earth
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (HEAVY MACHINE SHOP)

Building Number:	267
Distance:	4170 feet
General Construction:	single-story industrial, steel frame, 10-25 ton cranes
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	21-40
Cause of Damage:	blast
Roof Construction:	corrugated iron, steel trusses
Exterior Wall Construction:	steel frame
Exterior Wall Trim:	corrugated iron
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	earth
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT

Building Number:	268

MITSUBISHI STEEL AND ARMS PLANT
(Continued)

Distance:	4260 feet
General Construction:	single-story industrial, composite frame (concrete frame with structural steel trusses), cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	21-40
Cause of Damage:	blast
Roof Construction:	corrugated iron, steel trusses
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (SHOP)

Building Number:	269
Distance:	3980 feet
General Construction:	single-story industrial, steel frame, 10-25 ton cranes
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	61-80
Cause of Damage:	blast
Roof Construction:	corrugated iron, steel trusses
Exterior Wall Construction:	reinforced concrete and steel frame
Exterior Wall Trim:	corrugated iron

MITSUBISHI STEEL AND ARMS PLANT (SHOP)
(Continued)

Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (MACHINE SHOP AND ASSEMBLY)

Building Number:	270
Distance:	4440 feet
General Construction:	single-story industrial, steel frame, 10-25 ton cranes
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	wood, steel trusses
Exterior Wall Construction:	steel frame
Exterior Wall Trim:	corrugated iron
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete on ground for first floor; reinforced concrete on steel for second floor
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (OFFICES)

Building Number:	271
Distance:	4590 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant

MITSUBISHI STEEL AND ARMS PLANT (OFFICES)
(Continued)

Floors Above Ground:	5
Floors Below Ground:	none
Principal Building Use:	office
Percent Structural Damage:	1-20
Cause of Damage:	blast
Roof Construction:	reinforced concrete, 4 inches in thickness, steel trusses
Exterior Wall Construction:	reinforced concrete, 6 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete, wood lath
Interior Wall Finish:	plaster
Floor Construction:	reinforced concrete on ground for first floor; reinforced concrete, 5 inches in thickness, on steel for all other floors
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT

Building Number:	272
Distance:	4710 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	41-60
Cause of Damage:	blast
Roof Construction:	reinforced concrete, corrugated iron on steel trusses

MITSUBISHI STEEL AND ARMS PLANT
(Continued)

Exterior Wall Construction:	reinforced concrete, 6.5 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete for first floor; reinforced concrete, 6 inches in thickness, for second floor
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (MACHINE SHOP)

Building Number:	273
Distance:	4530 feet
General Construction:	single-story industrial, light-frame reinforced concrete, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	41-60
Cause of Damage:	blast
Roof Construction:	reinforced-concrete arch slab, 4 inches in thickness on reinforced-concrete ribs
Exterior Wall Construction:	reinforced concrete, 6 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (MACHINE SHOP)

Building Number:	274
Distance:	4710 feet
General Construction:	single-story industrial, light-frame reinforced concrete, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	unknown
Exterior Wall Construction:	unknown
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	unknown
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (MACHINE SHOP)

Building Number:	275
Distance:	4317 feet
General Construction:	single-story industrial, light-frame reinforced concrete, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	reinforced-concrete arch slab, 6 inches in thickness, on 12- by 18-inch reinforced-arch ribs

MITSUBISHI STEEL AND ARMS PLANT (MACHINE SHOP)
(Continued)

Exterior Wall Construction:	10- to 6-inch reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (BOILER HOUSE)

Building Number:	276
Distance:	4650 feet
General Construction:	single-story industrial, light steel frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	41-60
Cause of Damage:	blast
Roof Construction:	unknown
Exterior Wall Construction:	unknown
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	unknown
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (TRANSFORMER AND SWITCH ROOM)

Building Number:	277
Distance:	4665 feet
General Construction:	multistory industrial, reinforced concrete

MITSUBISHI STEEL AND ARMS PLANT (TRANSFORMER AND SWITCH ROOM) (Continued)

Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	corrugated iron and wood, steel trusses
Exterior Wall Construction:	reinforced concrete, 9 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	first floor, reinforced concrete; mezzanine floor, steel
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS PLANT (OFFICES)

Building Number:	278
Distance:	4755 feet
General Construction:	multistory industrial, reinforced concrete, conventional design
Floors Above Ground:	2
Floors Below Ground:	basement
Principal Building Use:	office
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced concrete
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood frame
Interior Wall Finish:	plaster
Floor Construction:	basement, open space under floor unfinished; first and second floors, reinforced concrete

MITSUBISHI STEEL AND ARMS PLANT (OFFICES) (Continued)

Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI STEEL AND ARMS CASTING PLANT (HEATING AND ROLLING MILL)

Building Number:	281
Distance:	4415 feet
General Construction:	single-story industrial, steel frame, 10-25 ton cranes
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	1-20
Cause of Damage:	blast
Roof Construction:	corrugated metal, steel purlins, steel trusses
Exterior Wall Construction:	steel frame
Exterior Wall Trim:	corrugated metal
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete and earth
Ceiling Construction:	unknown
Window and Door Framing:	metal sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TURBINE COMPONENT WORKS NO. 1 (MACHINE SHOP)

Building Number:	289
Distance:	6020 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100

MITSUBISHI TURBINE COMPONENT WORKS NO. 1 (MACHINE SHOP) (Continued)

Cause of Damage:	blast and fire
Roof Construction:	clay tile and asbestos shingle on wood sheathing and wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	wood siding
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete on earth
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TURBINE COMPONENT WORKS NO. 1 (STEAM PLANT)

Building Number:	290
Distance:	5910 feet
General Construction:	single-story industrial, very light steel frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	corrugated metal, light steel trusses
Exterior Wall Construction:	unknown
Exterior Wall Trim:	wood
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TURBINE COMPONENT WORKS NO. 1 (COMPRESSORS)

Building Number:	291

MITSUBISHI TURBINE COMPONENT WORKS NO. 1 (COMPRESSORS) (Continued)

Distance:	5890 feet
General Construction:	single-story industrial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	corrugated asbestos, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	wood siding
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	partial set, not detailed

MITSUBISHI TURBINE COMPONENT WORKS NO. 1 (HEAVY MACHINING)

Building Number:	292
Distance:	5720 feet
General Construction:	single-story industrial, steel frame, 10-25 ton cranes
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	1-20
Cause of Damage:	blast
Roof Construction:	corrugated metal and asbestos on wood purlins, steel trusses
Exterior Wall Construction:	steel frame
Exterior Wall Trim:	corrugated metal
Interior Wall Construction:	scattered blast walls, concrete, 7 feet high
Interior Wall Finish:	concrete

MITSUBISHI TURBINE COMPONENT WORKS NO. 1 (HEAVY MACHINING) (Continued)

Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TURBINE COMPONENT WORKS NO. 1 (PARTS STOCK ROOM)

Building Number:	293
Distance:	5460 feet
General Construction:	single-story industrial, masonry load bearing
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	manufacturing
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	clay tile in mud on wood sheathing and purlins on wood trusses
Exterior Wall Construction:	brick, load bearing
Exterior Wall Trim:	brick
Interior Wall Construction:	brick
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

MITSUBISHI TURBINE COMPONENT WORKS NO. 1 (STORAGE)

Building Number:	301
Distance:	5130 feet
General Construction:	multistory industrial, wood frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	warehouse

MITSUBISHI TURBINE COMPONENT WORKS NO. 1 (STORAGE)
(Continued)

Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	clay tile in mud on wood sheathing, rafters, and purlins; wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	wood siding
Interior Wall Construction:	wood
Interior Wall Finish:	unknown
Floor Construction:	concrete
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

NAGASAKI RAILWAY STATION (WAITING ROOM AND OFFICES)

Building Number:	312
Distance:	8260 feet
General Construction:	multistory commercial, wood frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	railroad and street car station
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	tile on wood sheathing, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	wood siding
Interior Wall Construction:	wood lath on wood studs
Interior Wall Finish:	wood trim and plaster
Floor Construction:	wood floor on wood joists
Ceiling Construction:	unknown
Window and Door Framing:	plain glass, wood frame
Floor Plans Available:	partial set, not detailed

BOYS' NORMAL SCHOOL (CLASSROOMS)

Building Number:	346
Distance:	6160 feet
General Construction:	multistory commercial, wood frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	tile on wood sheathing, light wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	stucco
Interior Wall Construction:	wood lath on wood studs
Interior Wall Finish:	plaster
Floor Construction:	wood floor on wood joists
Ceiling Construction:	unknown
Window and Door Framing:	unknown
Floor Plans Available:	partial set, not detailed

BOYS' NORMAL SCHOOL (CLASSROOMS)

Building Number:	351
Distance:	5915 feet
General Construction:	single-story commercial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	tile on wood sheathing, light wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	stucco
Interior Wall Construction:	wood lath on wood studs
Interior Wall Finish:	plaster
Floor Construction:	wood on wood joists
Ceiling Construction:	unknown

BOYS' NORMAL SCHOOL (CLASSROOMS)
(Continued)

Window and Door Framing:	unknown
Floor Plans Available:	partial set, not detailed

DIVINITY SCHOOL

Building Number:	352
Distance:	4670 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	41-60
Cause of Damage:	blast
Roof Construction:	tile on wood; trusses, bottom chord of concrete, all other members of wood
Exterior Wall Construction:	brick, 14 inches in thickness
Exterior Wall Trim:	brick
Interior Wall Construction:	brick and wood
Interior Wall Finish:	plaster
Floor Construction:	first floor, concrete slab and wood; second floor, reinforced concrete slab, 6 inches in thickness and 18- by 14-inch reinforced concrete beams; third floor, reinforced concrete slab, 6 inches in thickness and 18- by 10-inch reinforced concrete beams
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

DIVINITY SCHOOL

Building Number:	353
Distance:	4640 feet
General Construction:	single-story commercial, light reinforced-concrete frame, cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab, 4 inches in thickness, and 8- by 9-inch reinforced-concrete beams
Exterior Wall Construction:	north wall, reinforced concrete, 4 inches in thickness; east, west, and south walls, brick, 4 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	concrete on earth
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

YAMAZATO SCHOOL

Building Number:	354
Distance:	2173 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3
Floors Below Ground:	basement
Principal Building Use:	school
Percent Structural Damage:	21-40
Cause of Damage:	blast
Roof Construction:	reinforced-concrete slab

YAMAZATO SCHOOL
(Continued)

Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	basement, concrete on earth; all others, reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	plain glass, steel sash
Floor Plans Available:	partial set, not detailed

NAGASAKI COMMERCIAL SCHOOL

Building Number:	360
Distance:	3680 feet
General Construction:	single-story commercial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	warehouse
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	wood, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	wood siding
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	wood
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

NAGASAKI COMMERCIAL SCHOOL (SCHOOL)

Building Number:	361
Distance:	3590 feet

NAGASAKI COMMERCIAL SCHOOL (SCHOOL)
(Continued)

General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	1-20
Cause of Damage:	blast and fire
Roof Construction:	reinforced-concrete slab, 5 inches in thickness, on 25- by 15-inch girders and 19- by 12-inch reinforced-concrete beams
Exterior Wall Construction:	reinforced concrete, 10 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete
Interior Wall Finish:	plaster and wood
Floor Construction:	first and second floors, reinforced-concrete girders and 19- by 12-inch reinforced-concrete beams; third floor, reinforced-concrete slab, 5 inches in thickness, on haunched 25- by 15-inch beams
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

NAGASAKI COMMERCIAL SCHOOL (MACHINE SHOP)

Building Number:	362
Distance:	3525 feet
General Construction:	single-story commercial, composite frame (concrete frame with structural steel trusses), cranes of less than 10 tons

NAGASAKI COMMERCIAL SCHOOL (MACHINE SHOP)
(Continued)

Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	wood, steel trusses
Exterior Wall Construction:	reinforced concrete, 9 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	wood and plaster
Floor Construction:	wood
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

NAGASAKI COMMERCIAL SCHOOL (MACHINE SHOP)

Building Number:	363
Distance:	3640 feet
General Construction:	single-story commercial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	wood, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

NAGASAKI COMMERCIAL SCHOOL (MACHINE SHOP)

Building Number:	364
Distance:	3570 feet
General Construction:	single-story commercial, composite frame (concrete frame with structural steel trusses), cranes of less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	61-80
Cause of Damage:	blast
Roof Construction:	tile on wood, steel trusses
Exterior Wall Construction:	reinforced concrete, 8 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete, 5 inches in thickness
Interior Wall Finish:	unknown
Floor Construction:	reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, not detailed

URAKAMI CATHEDRAL (CATHEDRAL)

Building Number:	372
Distance:	1595 feet
General Construction:	single-story commercial, masonry load bearing
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	shrine, temple, or church
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	tile on wood, wood trusses
Exterior Wall Construction:	brick, 28 inches in thickness with buttresses
Exterior Wall Trim:	brick
Interior Wall Construction:	unknown

URAKAMI CATHEDRAL (CATHEDRAL)
(Continued)

Interior Wall Finish:	unknown
Floor Construction:	wood
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

SHIROYAMA SCHOOL

Building Number:	376
Distance:	1674 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	reinforced-concrete slab, 5.5 inches in thickness on 12- by 21.5-inch reinforced-concrete beams and 12- by 24-inch reinforced-concrete girders
Exterior Wall Construction:	reinforced concrete, 12 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete and wood
Interior Wall Finish:	wood and plaster
Floor Construction:	first floor, wood; second and third floor, same as roof
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, detailed

SHIROYAMA SCHOOL

Building Number:	377
Distance:	1710 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3
Floors Below Ground:	unknown
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	reinforced-concrete slab, 5.5 inches in thickness, on 12- by 14-inch reinforced-concrete beams and 12- by 21-inch reinforced-concrete girders
Exterior Wall Construction:	reinforced concrete, 12 inches in thickness, with brick panels
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	wood and plaster
Floor Construction:	first floor, wood flooring on concrete slab; second and third floors, same as roof
Ceiling Construction:	unknown
Window and Door Framing:	steel sash
Floor Plans Available:	partial set, detailed

CHINZEI SCHOOL

Building Number:	388
Distance:	1542 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	4
Floors Below Ground:	basement
Principal Building Use:	school
Percent Structural Damage:	81-100

CHINZEI SCHOOL
(Continued)

Cause of Damage:	blast
Roof Construction:	reinforced-concrete slab for 3/8 of building, tile and wood for 5/8 of building
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath
Interior Wall Finish:	wood trim and plaster
Floor Construction:	basement, concrete; all other floors, reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	wood
Floor Plans Available:	full set, first and second floors detailed

CHINZEI SCHOOL

Building Number:	389
Distance:	1747 feet
General Construction:	single-story commercial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	tile on wood sheathing, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	wood siding
Interior Wall Construction:	wood studs
Interior Wall Finish:	unknown
Floor Construction:	wood floor on wood joists
Ceiling Construction:	unknown
Window and Door Framing:	wood
Floor Plans Available:	full set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (PSYCHOPATHIC WARD)

Building Number:	392
Distance:	2345 feet
General Construction:	multistory commercial, reinforced-concrete frame, conventional design
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath between columns
Interior Wall Finish:	plaster
Floor Construction:	concrete on earth, first floor; reinforced-concrete slab, second floor
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (TUBERCULAR WARD)

Building Number:	396
Distance:	2075 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath between columns
Interior Wall Finish:	plaster
Ceiling Construction:	unknown

NAGASAKI UNIVERSITY HOSPITAL (TUBERCULAR WARD) (Continued)

Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (EPIDEMIC WARD)

Building Number:	397
Distance:	2378 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	2
Floors Below Ground:	basement
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath between columns
Interior Wall Finish:	plaster
Floor Construction:	basement, concrete; first and second floor, reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (UROLOGICAL WARD)

Building Number:	398
Distance:	2258 feet
General Construction:	multistory commercial, reinforced-concrete frame, conventional design
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	hospital

NAGASAKI UNIVERSITY HOSPITAL (UROLOGICAL WARD) (Continued)

Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath between columns
Interior Wall Finish:	wood and plaster
Floor Construction:	first floor, concrete; second floor, reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (OPHTHALMIC WARD)

Building Number:	400
Distance:	2115 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	2
Floors Below Ground:	basement
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath between columns
Interior Wall Finish:	plaster
Floor Construction:	basement, concrete; first and second floor, reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (PEDIATRICS WARD)

Building Number:	401
Distance:	2082 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete, 5-inch parapet walls
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath between columns
Interior Wall Finish:	plaster
Floor Construction:	first floor, concrete; second floor, reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (OPERATING ROOMS)

Building Number:	402
Distance:	2145 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab, 4 inches in thickness, and 12- by 16-inch reinforced-concrete beams

NAGASAKI UNIVERSITY HOSPITAL (OPERATING ROOMS) (Continued)

Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	one, reinforced concrete; others, wood lath
Interior Wall Finish:	wood and plaster
Floor Construction:	first floor, concrete; second floor, reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (OPERATING ROOMS)

Building Number:	403
Distance:	2205 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath
Interior Wall Finish:	wood and plaster
Floor Construction:	first floor, concrete; second floor, reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (ORTHOPEDIC WARD)

Building Number:	404
Distance:	2315 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	2
Floors Below Ground:	basement
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath
Interior Wall Finish:	wood and plaster
Floor Construction:	basement, concrete; first and second floors, reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (KITCHEN)

Building Number:	407
Distance:	2465 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	2
Floors Below Ground:	basement
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath
Interior Wall Finish:	wood trim and plaster

NAGASAKI UNIVERSITY HOSPITAL (KITCHEN)
(Continued)

Floor Construction:	basement, concrete; first and second floors, reinforced concrete
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (LAUNDRY)

Building Number:	408
Distance:	2510 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath and wood studs
Interior Wall Finish:	wood trim and plaster
Floor Construction:	first floor, concrete; second floor, reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (ADMINISTRATION)

Building Number:	409
Distance:	2410 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant

NAGASAKI UNIVERSITY HOSPITAL (ADMINISTRATION)
(Continued)

Floors Above Ground:	3
Floors Below Ground:	basement
Principal Building Use:	office
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete, 8-inch parapet
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath on wood studs
Interior Wall Finish:	wood trim and plaster
Floor Construction:	basement, concrete; first, second, and third floors, reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (WARDS)

Building Number:	410
Distance:	2235 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	3
Floors Below Ground:	basement
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete, 8-inch parapet
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath on wood studs
Interior Wall Finish:	wood trim and plaster
Floor Construction:	basement, concrete floor; first, second, and third floors, reinforced-concrete slab

NAGASAKI UNIVERSITY HOSPITAL (WARDS)
(Continued)

Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (WARDS)

Building Number:	413
Distance:	2162 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant
Floors Above Ground:	3
Floors Below Ground:	none
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab, 4 inches in thickness
Exterior Wall Construction:	reinforced concrete, 8-inch parapet
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath
Interior Wall Finish:	wood trim and plaster
Floor Construction:	first floor, concrete; second and third floors, reinforced-concrete slab, 4 inches in thickness
Ceiling Construction:	unknown
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (SURGICAL WARD)

Building Number:	415
Distance:	2085 feet
General Construction:	multistory reinforced-concrete frame, earthquake resistant

NAGASAKI UNIVERSITY HOSPITAL (SURGICAL WARD)
(Continued)

Floors Above Ground:	3
Floors Below Ground:	basement
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete, 8 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath
Interior Wall Finish:	wood trim and plaster
Floor Construction:	reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	steel
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (SURGICAL WARD)

Building Number:	416
Distance:	2035 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	3
Floors Below Ground:	none
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath
Interior Wall Finish:	wood trim and plaster
Floor Construction:	reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

NAGASAKI UNIVERSITY HOSPITAL (CLINIC)

Building Number:	417
Distance:	2015 feet
General Construction:	single story, very light reinforced-concrete frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	hospital
Percent Structural Damage:	none
Cause of Damage:	none
Roof Construction:	reinforced-concrete slab
Exterior Wall Construction:	reinforced concrete with 4-foot parapet
Exterior Wall Trim:	unknown
Interior Wall Construction:	wood lath
Interior Wall Finish:	wood trim and plaster
Floor Construction:	reinforced-concrete slab
Ceiling Construction:	unknown
Window and Door Framing:	metal
Floor Plans Available:	partial set, not detailed

FUCHI SCHOOL (CLASSROOMS AND OFFICES)

Building Number:	425
Distance:	3840 feet
General Construction:	multistory reinforced-concrete frame, earth-quake resistant
Floors Above Ground:	3
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	1-20
Cause of Damage:	blast
Roof Construction:	cement on waterproofing over reinforced-concrete slab and beams
Exterior Wall Construction:	reinforced concrete
Exterior Wall Trim:	unknown
Interior Wall Construction:	reinforced concrete and wood
Interior Wall Finish:	wood trim and plaster

FUCHI SCHOOL (CLASSROOMS AND OFFICES)
(Continued)

Floor Construction:	reinforced-concrete slab and beams
Ceiling Construction:	unknown
Window and Door Framing:	metal sash
Floor Plans Available:	partial set, not detailed

FUCHI SCHOOL (AUDITORIUM AND GYMNASIUM)

Building Number:	426
Distance:	3855 feet
General Construction:	single-story commercial, composite frame (concrete frame with structural steel trusses), cranes less than 10 tons
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	auditorium, library, etc.
Percent Structural Damage:	81-100
Cause of Damage:	blast
Roof Construction:	asbestos shingles, wood sheathing, steel purlins, steel trusses
Exterior Wall Construction:	reinforced concrete, 7 inches in thickness
Exterior Wall Trim:	unknown
Interior Wall Construction:	unknown
Interior Wall Finish:	wood trim and plaster
Floor Construction:	wood flooring and framing on reinforced-concrete piers
Ceiling Construction:	unknown
Window and Door Framing:	metal sash
Floor Plans Available:	partial set, not detailed

FUCHI SCHOOL (GYMNASIUM)

Building Number:	427

FUCHI SCHOOL (GYMNASIUM)
(Continued)

Distance:	3930 feet
General Construction:	single-story commercial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	auditorium, library, etc.
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	asbestos shingles, wood sheathing, purlins, and trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	weatherboards
Interior Wall Construction:	wood studs
Interior Wall Finish:	wood
Floor Construction:	wood flooring and framing
Ceiling Construction:	none
Window and Door Framing:	sliding wood sash
Floor Plans Available:	partial set, not detailed

FUCHI SCHOOL (DRESSING ROOMS)

Building Number:	428
Distance:	3850 feet
General Construction:	single-story commercial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	auditorium, library, etc.
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	asbestos shingles, wood sheathing, rafters, purlins, and trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	wood siding
Interior Wall Construction:	wood studs
Interior Wall Finish:	wood

FUCHI SCHOOL (DRESSING ROOMS)
(Continued)

Floor Construction:	80-percent reinforced-concrete on earth, 20-percent wood flooring and framing
Ceiling Construction:	unknown
Window and Door Framing:	sliding wood sash
Floor Plans Available:	partial set, not detailed

FUCHI SCHOOL (CLASSROOMS)

Building Number:	429
Distance:	3955 feet
General Construction:	multistory commercial, wood frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	asbestos shingles, wood sheathing and purlins, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	weatherboards
Interior Wall Construction:	wood studs
Interior Wall Finish:	wood, possibly some plaster
Floor Construction:	wood flooring and framing
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

FUCHI SCHOOL (CLASSROOMS)

Building Number:	430
Distance:	3990 feet
General Construction:	multistory commercial, wood frame

FUCHI SCHOOL (CLASSROOMS)
(Continued)

Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	asbestos shingles, wood sheathing and purlins, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	weatherboards
Interior Wall Construction:	wood studs
Interior Wall Finish:	wood, possibly some plaster
Floor Construction:	wood flooring and framing
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

FUCHI SCHOOL (CLASSROOMS)

Building Number:	431
Distance:	3830 feet
General Construction:	multistory commercial, wood frame
Floors Above Ground:	2
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	asbestos shingles, wood sheathing and purlins, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	weatherboards
Interior Wall Construction:	wood studs
Interior Wall Finish:	wood, possibly some plaster
Floor Construction:	wood flooring and framing
Ceiling Construction:	unknown

FUCHI SCHOOL (CLASSROOMS)
(Continued)

Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

FUCHI SCHOOL (CLASSROOMS AND SHOPS)

Building Number:	432
Distance:	3990 feet
General Construction:	multistory commercial, wood frame
Floors Above Ground:	1
Floors Below Ground:	none
Principal Building Use:	school
Percent Structural Damage:	81-100
Cause of Damage:	blast and fire
Roof Construction:	asbestos shingles, wood sheathing and purlins, wood trusses
Exterior Wall Construction:	wood frame
Exterior Wall Trim:	weatherboards
Interior Wall Construction:	wood studs
Interior Wall Finish:	wood, possibly some plaster
Floor Construction:	wood flooring and framing
Ceiling Construction:	unknown
Window and Door Framing:	wood sash
Floor Plans Available:	partial set, not detailed

NAGASAKI PREFECTURAL OFFICE AND COURTHOUSE

Building Number:	464
Distance:	11,020 feet
General Construction:	multistory commercial, masonry load bearing
Floors Above Ground:	2
Floors Below Ground:	basement
Principal Building Use:	office
Percent Structural Damage:	81-100
Cause of Damage:	fire

NAGASAKI PREFECTURAL OFFICE AND COURTHOUSE
(Continued)

Roof Construction:	slate and sheet metal on wood sheathing and purlins, steel trusses
Exterior Wall Construction:	load-bearing brick
Exterior Wall Trim:	stucco
Interior Wall Construction:	load-bearing brick
Interior Wall Finish:	plaster, wood trim
Floor Construction:	basement, concrete on earth; first floor, reinforced-concrete slab; second floor, wood flooring and framing on steel main beams
Ceiling Construction:	unknown
Window and Door Framing:	wood, double-hung
Floor Plans Available:	partial set, not detailed

APPENDIX D

CASUALTY DATA FOR SPECIFIC PUBLIC BUILDINGS IN HIROSHIMA

This appendix lists the number of case histories located for each of the public buildings given in Appendix B. The building number listed is the same as that used in coding the original data and is the key in relating the casualty information contained in this appendix with the construction details given in Appendix B. The data presented are subdivided by floor and specific casualty category (dead, injured, uninjured, and missing). In addition, two entries are provided for each of these subdivisions. The first number listed indicates the total number of case histories that were located in the data, and the number in parenthesis indicates those that can be physically positioned on each floor. The information given for each building is then summed if data are available for more than one floor.

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN HIROSHIMA

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
10	unk*	1	1	-	-	-
		(0)	(0)	-	-	-
11	1	5	3	2	-	-
		(5)	(3)	(2)	-	-
	2	4	4	-	-	-
		(3)	(3)	-	-	-
	unk	16	16	-	-	-
		(0)	(0)	-	-	-
	Total	25	23	2	-	-
		(8)	(6)	(2)	-	-
18	1	3	-	3	-	-
		(3)	-	(3)	-	-
	2	1	-	1	-	-
		(1)	-	(1)	-	-
	Total	4	-	4	-	-
		(4)	-	(4)	-	-
22	1	1	-	1	-	-
		(1)	-	(1)	-	-
23	B**	2	-	-	2	-
		(0)	-	-	(0)	-
	1	1	-	1	-	-
		(1)	-	(1)	-	-
	2	3	-	3	-	-
		(1)	-	(1)	-	-
	3	6	1	5	-	-
		(1)	(0)	(1)	-	-
	4	2	-	2	-	-
		(1)	-	(1)	-	-
	7	1	1	-	-	-
		(0)	(0)	-	-	-
	Total	15	2	11	2	-
		(4)	(0)	(4)	(0)	-

*unknown

**basement

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN HIROSHIMA

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
24	1	9 (4)	2 (1)	6 (3)	1 (0)	- -
	2	4 (1)	1 (0)	2 (1)	1 (0)	- -
	3	66 (43)	34 (23)	29 (17)	- -	3 (3)
	unk	17 (0)	6 (0)	9 (0)	2 (0)	- -
	Total	96 (48)	43 (24)	46 (21)	4 (0)	3 (3)
26	B	11 (10)	6 (5)	5 (5)	- -	- -
	1	74 (73)	24 (24)	28 (28)	5 (4)	17 (17)
	2	37 (34)	6 (6)	24 (21)	3 (3)	4 (4)
	3	66 (66)	17 (17)	19 (19)	7 (7)	23 (23)
	4	34 (32)	5 (5)	17 (15)	- -	12 (12)
	5	6 (6)	1 (1)	3 (3)	- -	2 (2)
	unk	1 (0)	- -	1 (0)	- -	- -
	Total	229 (221)	59 (58)	97 (91)	15 (14)	58 (58)
28	B	29 (25)	4 (1)	22 (21)	2 (2)	1 (1)
	1	85 (84)	7 (7)	70 (69)	4 (4)	4 (4)
	2	60 (59)	5 (4)	47 (47)	8 (8)	- -
	3	45 (44)	3 (3)	39 (38)	2 (2)	1 (1)

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN HIROSHIMA

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
28 (Cont.)	4	11 (11)	- -	11 (11)	- -	- -
	unk	4 (0)	- -	4 (0)	- -	- -
	Total	234 (223)	19 (15)	193 (186)	16 (16)	6 (6)
31	1	2 (0)	- -	2 (0)	- -	- -
	2	6 (0)	- -	6 (0)	- -	- -
	3	5 (0)	- -	5 (0)	- -	- -
	unk	3 (0)	- -	2 (0)	1 (0)	- -
	Total	16 (0)	- -	15 (0)	1 (0)	- -
33	1	1 (1)	- -	1 (1)	- -	- -
	2	1 (1)	- -	1 (1)	- -	- -
	Total	2 (2)	- -	2 (2)	- -	- -
34	1	1 (1)	- -	1 (1)	- -	- -
39	2	1 (1)	- -	1 (1)	- -	- -
40	B	4 (4)	- -	3 (3)	1 (1)	- -
	1	7 (7)	- -	6 (6)	1 (1)	- -

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN HIROSHIMA

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
40	2	30	-	22	7	1
(Cont.)		(29)	-	(21)	(7)	(1)
	3	23	-	17	6	-
		(18)	-	(13)	(5)	-
	4	6	-	3	3	-
		(5)	-	(2)	(3)	-
	unk	1	-	1	-	-
		(0)	-	(0)	-	-
	Total	71	-	52	18	1
		(63)	-	(45)	(17)	(1)
47	B	3	-	1	2	-
		(2)	-	(1)	(1)	-
	1	5	-	5	-	-
		(4)	-	(4)	-	-
	2	6	-	6	-	-
		(6)	-	(6)	-	-
	3	12	-	11	1	-
		(11)	-	(10)	(1)	-
	4	10	-	9	1	-
		(7)	-	(6)	(1)	-
	6	3	-	2	1	-
		(2)	-	(2)	(0)	-
	7	39	1	35	3	-
		(28)	(0)	(25)	(3)	-
	unk	2	1	-	1	-
		(0)	(0)	-	(0)	-
	Total	80	2	69	9	-
		(60)	(0)	(54)	(6)	-
48	1	1	-	1	-	-
		(1)	-	(1)	-	-

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN HIROSHIMA

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
50	1	24	-	12	5	7
		(21)	-	(11)	(3)	(7)
	2	61	1	37	1	22
		(55)	(0)	(33)	(1)	(21)
	3	68	13	21	34	-
		(44)	(12)	(20)	(12)	-
	unk	17	7	9	-	1
		(0)	(0)	(0)	-	(0)
	Total	170	21	79	40	30
		(120)	(12)	(64)	(16)	(28)
56	1	2	-	2	-	-
		(1)	-	(1)	-	-
	3	1	-	1	-	-
		(1)	-	(1)	-	-
	4	1	-	1	-	-
		(1)	-	(1)	-	-
	6	3	1	2	-	-
		(3)	(1)	(2)	-	-
	Total	7	1	6	-	-
		(6)	(1)	(5)	-	-
58	1	2	-	1	1	-
		(2)	-	(1)	(1)	-
	3	1	-	1	-	-
		(0)	-	(0)	-	-
	Total	3	-	2	1	-
		(2)	-	(1)	(1)	-
63	1	2	-	2	-	-
		(2)	-	(2)	-	-
64	1	7	-	6	-	1
		(7)	-	(6)	-	(1)
	2	6	-	4	2	-
		(6)	-	(4)	(2)	-

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN HIROSHIMA

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
64	Total	13	-	10	2	1
(Cont.)		(13)	-	(10)	(2)	(1)
68	1	13	1	6	2	4
		(12)	(1)	(5)	(2)	(4)
	2	15	2	5	4	4
		(14)	(2)	(4)	(4)	(4)
	pent-	2	-	2	-	-
	house	(2)	-	(2)	-	-
	unk	5	1	1	-	3
		(0)	(0)	(0)	-	(0)
	Total	35	4	14	6	11
		(28)	(3)	(11)	(6)	(8)
71	1	18	-	16	-	2
		(0)	-	(0)	-	(0)
	2	10	2	7	-	1
		(0)	(0)	(0)	-	(0)
	unk	2	-	1	-	1
		(0)	-	(0)	-	(0)
	Total	30	2	24	-	4
		(0)	(0)	(0)	-	(0)
72	1	5	-	4	1	-
		(2)	-	(1)	(1)	-
	2	15	-	14	1	-
		(9)	-	(9)	(0)	-
	3	12	-	11	1	-
		(6)	-	(5)	(1)	-
	4	38	-	35	3	-
		(22)	-	(22)	(0)	-
	unk	2	-	1	1	-
		(0)	-	(0)	(0)	-
	Total	72	-	65	7	-
		(39)	-	(37)	(2)	-

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN HIROSHIMA

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
87	1	4	-	4	-	-
		(3)	-	(3)	-	-
89	1	3	-	2	1	-
		(3)	-	(2)	(1)	-
	2	10	-	7	3	-
		(10)	-	(7)	(3)	-
	Total	13	-	9	4	-
		(13)	-	(9)	(4)	-
92	1	15	-	12	3	-
		(15)	-	(12)	(3)	-
93	1	1	-	-	1	-
		(1)	-	-	(1)	-
97	1	1	-	1	-	-
		(1)	-	(1)	-	-
	3	5	-	3	2	-
		(5)	-	(3)	(2)	-
	Total	6	-	4	2	-
		(6)	-	(4)	(2)	-
98	1	3	-	2	1	-
		(3)	-	(2)	(1)	-
	2	1	-	1	-	-
		(1)	-	(1)	-	-
	Total	4	-	3	1	-
		(4)	-	(3)	(1)	-
104	2	2	-	2	-	-
		(2)	-	(2)	-	-
108	1	1	-	1	-	-
		(1)	-	(1)	-	-
116	1	20	-	16	4	-
		(20)	-	(16)	(4)	-

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN HIROSHIMA

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
120	1	3	-	3	-	-
		(3)	-	(3)	-	-
123	1	15	-	14	1	-
		(15)	-	(14)	(1)	-
124	1	2	-	2	-	-
		(2)	-	(2)	-	-
152	1	8	-	7	1	-
		(6)	-	(5)	(1)	-
	2	7	-	6	1	-
		(4)	-	(3)	(1)	-
	unk	8	-	7	1	-
		(0)	-	(0)	(0)	-
	Total	23	-	20	3	-
		(10)	-	(8)	(2)	-
153	1	3	-	2	1	-
		(2)	-	(2)	(0)	-
155	unk	1	-	1	-	-
		(0)	-	(0)	-	-
167	1	2	-	2	-	-
		(2)	-	(2)	-	-
500	1	9	-	6	3	-
		(0)	-	(0)	(0)	-
501	1	43	-	29	14	-
		(0)	-	(0)	(0)	-
502	1	19	-	7	12	-
		(0)	-	(0)	(0)	-
	2	15	-	14	1	-
		(0)	-	(0)	(0)	-
	Total	34	-	21	13	-
		(0)	-	(0)	(0)	-

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN HIROSHIMA

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
503	1	13	3	8	-	2
		(10)	(3)	(5)	-	(2)
	2	8	1	6	-	1
		(6)	(0)	(5)	-	(1)
	Total	21	4	14	-	3
		(16)	(3)	(10)	-	(3)
504	1	1	-	1	-	-
		(0)	-	(0)	-	-
505	1	141	-	112	29	-
		(115)	-	(95)	(20)	-
506	Shelter	42	2	31	3	6
		(36)	(2)	(25)	(3)	(6)

APPENDIX E

CASUALTY DATA FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

This appendix lists the number of case histories located for each of the public buildings given in Appendix C. The building number listed is the same as that used in coding the original data and is the key in relating the casualty information contained in this appendix with the construction details given in Appendix C. The data presented are subdivided by floor and specific casualty category (dead, injured, uninjured, and missing). In addition, two entries are provided for each of these subdivisions. The first number listed indicates the total number of case histories that were located in the data, and the number in parenthesis indicates those that can be physically positioned on each floor. The information given for each building is then summed if data are available for more than one floor.

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
200	1	1	-	1	-	-
		(1)	-	(1)	-	-
201	1	1	-	1	-	-
		(1)	-	(1)	-	-
202	1	1	-	1	-	-
		(1)	-	(1)	-	-
	2	2	-	2	-	-
		(1)	-	(1)	-	-
	Total	3	-	3	-	-
		(2)	-	(2)	-	-
203	1	24	-	20	3	1
		(21)	-	(17)	(3)	(1)
204	1	8	-	8	-	-
		(7)	-	(7)	-	-
205	1	4	-	3	1	-
		(3)	-	(2)	(1)	-
207	1	1	-	-	1	-
		(1)	-	-	(1)	-
208	1	1	-	1	-	-
		(1)	-	(1)	-	-
209	1	1	-	-	1	-
		(1)	-	-	(1)	-
210	1	1	-	1	-	-
		(1)	-	(1)	-	-
211	1	1	-	1	-	-
		(1)	-	(1)	-	-
212	1	29	-	25	4	-
		(25)	-	(21)	(4)	-

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
213	1	9	-	9	-	-
		(9)	-	(9)	-	-
214	1	9	-	9	-	-
		(9)	-	(9)	-	-
215	1	3	-	3	-	-
		(3)	-	(3)	-	-
216	1	1	-	1	-	-
		(1)	-	(1)	-	-
217	1	1	-	-	1	-
		(1)	-	-	(1)	-
218	1	4	-	4	-	-
		(4)	-	(4)	-	-
219	1	16	-	16	-	-
		(10)	-	(10)	-	-
220	1	4	-	3	1	-
		(3)	-	(2)	(1)	-
221	1	12	-	10	2	-
		(10)	-	(8)	(2)	-
222	1	69	-	62	7	-
		(65)	-	(59)	(6)	-
223	1	49	-	47	2	-
		(43)	-	(41)	(2)	-
224	1	7	-	6	1	-
		(6)	-	(5)	(1)	-
225	1	7	-	5	2	-
		(6)	-	(4)	(2)	-
226	1	12	-	11	1	-
		(7)	-	(6)	(1)	-

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
227	1	1	-	1	-	-
		(1)	-	(1)	-	-
228	1	2	-	2	-	-
		(2)	-	(2)	-	-
229	B*	2	-	-	2	-
		(2)	-	-	(2)	-
	1	15	-	11	4	-
		(11)	-	(10)	(1)	-
	2	13	-	12	-	1
		(8)	-	(8)	-	(0)
	3	26	-	22	4	-
		(23)	-	(19)	(4)	-
	Total	56	-	45	10	1
		(44)	-	(37)	(7)	(0)
230	1	4	-	4	-	-
		(2)	-	(2)	-	-
232	1	29	-	21	3	5
		(19)	-	(14)	(3)	(2)
	2	6	-	6	-	-
		(5)	-	(5)	-	-
	Total	35	-	27	3	5
		(24)	-	(19)	(3)	(2)
233	2	1	-	1	-	-
		(1)	-	(1)	-	-
235	1	1	-	1	-	-
		(1)	-	(1)	-	-
243	1	2	-	1	1	-
		(0)	-	(0)	(0)	-

*basement

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
251	1	1	-	1	-	-
		(1)	-	(1)	-	-
253	1	1	-	1	-	-
		(1)	-	(1)	-	-
255	1	1	-	1	-	-
		(0)	-	(0)	-	-
258	1	1	-	1	-	-
		(1)	-	(1)	-	-
259	1	17	-	16	1	-
		(17)	-	(16)	(1)	-
	2	9	-	8	1	-
		(6)	-	(5)	(1)	-
	3	11	-	10	1	-
		(8)	-	(7)	(1)	-
	Total	37	-	34	3	-
		(31)	-	(28)	(3)	-
260	1	1	-	1	-	-
		(1)	-	(1)	-	-
262	1	3	-	2	-	1
		(3)	-	(2)	-	(1)
264	1	5	-	4	1	-
		(3)	-	(2)	(1)	-
	2	10	-	9	-	1
		(7)	-	(6)	-	(1)
	Total	15	-	13	1	1
		(10)	-	(8)	(1)	(1)
266	1	4	-	4	-	-
		(4)	-	(4)	-	-
267	1	12	-	12	-	-
		(12)	-	(12)	-	-

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
268	1	4	-	2	2	-
		(4)	-	(2)	(2)	-
269	1	8	-	7	-	1
		(7)	-	(6)	-	(1)
270	1	16	-	15	-	1
		(12)	-	(12)	-	(0)
	2	12	-	11	1	-
		(9)	-	(9)	(0)	-
	Total	28	-	26	1	1
		(21)	-	(21)	(0)	(0)
271	1	6	-	4	2	-
		(3)	-	(2)	(1)	-
272	1	6	-	6	-	-
		(3)	-	(3)	-	-
	2	2	-	2	-	-
		(1)	-	(1)	-	-
	Total	8	-	8	-	-
		(4)	-	(4)	-	-
273	1	11	-	11	-	-
		(10)	-	(10)	-	-
274	1	20	-	16	4	-
		(20)	-	(16)	(4)	-
275	1	29	-	29	-	-
		(28)	-	(28)	-	-
276	1	6	-	6	-	-
		(5)	-	(5)	-	-
277	1	13	-	10	2	1
		(13)	-	(10)	(2)	(1)
	2	13	-	10	2	1
		(10)	-	(8)	(2)	(0)
	Total	26	-	20	4	2
		(23)	-	(18)	(4)	(1)

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
278	1	19	-	13	3	3
		(10)	-	(7)	(2)	(1)
	2	10	-	7	3	-
		(10)	-	(7)	(3)	-
	Total	29	-	20	6	3
		(20)	-	(14)	(5)	(1)
281	1	3	-	-	3	-
		(3)	-	-	(3)	-
289	1	1	-	1	-	-
		(1)	-	(1)	-	-
290	1	4	-	3	1	-
		(4)	-	(3)	(1)	-
291	1	1	-	1	-	-
		(1)	-	(1)	-	-
292	1	10	-	9	1	-
		(10)	-	(9)	(1)	-
293	1	2	-	1	1	-
		(2)	-	(1)	(1)	-
301	1	2	-	1	1	-
		(2)	-	(1)	(1)	-
	2	2	-	1	1	-
		(2)	-	(1)	(1)	-
	Total	4	-	2	2	-
		(4)	-	(2)	(2)	-
312	1	1	-	1	-	-
		(0)	-	(0)	-	-
346	1	6	-	6	-	-
		(1)	-	(1)	-	-

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
346	2	3	-	3	-	-
(Cont.)		(0)	-	(0)	-	-
	Total	9	-	9	-	-
		(1)	-	(1)	-	-
351	1	2	-	1	1	-
		(2)	-	(1)	(1)	-
352	1	1	-	1	-	-
		(1)	-	(1)	-	-
353	1	2	-	2	-	-
		(2)	-	(2)	-	-
354	1	4	-	4	-	-
		(4)	-	(4)	-	-
360	1	1	-	1	-	-
		(1)	-	(1)	-	-
361	1	39	-	36	3	-
		(29)	-	(28)	(1)	-
	2	10	-	10	-	-
		(9)	-	(9)	-	-
	3	5	-	5	-	-
		(4)	-	(4)	-	-
	Total	54	-	51	3	-
		(42)	-	(41)	(1)	-
362	1	3	-	3	-	-
		(2)	-	(2)	-	-
363	1	6	-	5	-	1
		(5)	-	(4)	-	(1)
364	1	3	-	3	-	-
		(3)	-	(3)	-	-
372	1	2	-	2	-	-
		(2)	-	(2)	-	-

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
376	1	9 (9)	4 (4)	3 (3)	1 (1)	1 (1)
	2	11 (11)	5 (5)	5 (5)	- -	1 (1)
	Total	20 (20)	9 (9)	8 (8)	1 (1)	2 (2)
377	1	6 (6)	4 (4)	- -	- -	2 (2)
	2	31 (31)	24 (24)	6 (6)	- -	1 (1)
	3	64 (63)	61 (60)	- -	- -	3 (3)
	Total	(101) (100)	89 (88)	6 (6)	- -	6 (6)
388	B	5 (5)	1 (1)	4 (4)	- -	- -
	1	31 (31)	20 (20)	10 (10)	- -	1 (1)
	2	46 (46)	42 (42)	4 (4)	- -	- -
	3	6 (6)	6 (6)	- -	- -	- -
	4	3 (3)	3 (3)	- -	- -	- -
	Total	91 (91)	72 (72)	18 (18)	- -	1 (1)
389	1	27 (27)	26 (26)	- -	- -	1 (1)
392	1	4 (4)	- -	4 (4)	- -	- -

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
396	1	4	-	4	-	-
		(4)	-	(4)	-	-
	2	2	-	2	-	-
		(2)	-	(2)	-	-
	Total	6	-	6	-	-
		(6)	-	(6)	-	-
397	1	2	-	1	1	-
		(2)	-	(1)	(1)	-
	2	2	-	2	-	-
		(2)	-	(2)	-	-
	Total	4	-	3	1	-
		(4)	-	(3)	(1)	-
398	1	11	4	6	-	1
		(11)	(4)	(6)	-	(1)
	2	10	3	5	1	1
		(10)	(3)	(5)	(1)	(1)
	Total	21	7	11	1	2
		(21)	(7)	(11)	(1)	(2)
400	B	2	-	2	-	-
		(2)	-	(2)	-	-
	1	3	-	3	-	-
		(3)	-	(3)	-	-
	2	1	-	1	-	-
		(1)	-	(1)	-	-
	Total	6	-	6	-	-
		(6)	-	(6)	-	-
401	1	4	-	4	-	-
		(4)	-	(4)	-	-
402	1	13	-	1	-	12
		(13)	-	(1)	-	(12)

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
403	1	10	1	7	2	-
		(10)	(1)	(7)	(2)	-
	2	3	2	1	-	-
		(3)	(2)	(1)	-	-
	Total	13	3	8	2	-
		(13)	(3)	(8)	(2)	-
404	1	1	-	1	-	-
		(1)	-	(1)	-	-
	2	1	-	-	1	-
		(1)	-	-	(1)	-
	Total	2	-	1	1	-
		(2)	-	(1)	(1)	-
407	1	2	-	2	-	-
		(2)	-	(2)	-	-
	2	2	-	1	1	-
		(2)	-	(1)	(1)	-
	Total	4	-	3	1	-
		(4)	-	(3)	(1)	-
408	1	1	-	1	-	-
		(1)	-	(1)	-	-
409	B	4	-	2	2	-
		(4)	-	(2)	(2)	-
	1	85	1	65	11	8
		(82)	(0)	(64)	(10)	(8)
	2	31	-	27	3	1
		(28)	-	(25)	(3)	(0)
	3	19	-	9	5	5
		(19)	-	(9)	(5)	(5)
	Total	139	1	103	21	14
		(133)	(0)	(100)	(20)	(13)

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
410	B	1 (1)	- -	1 (1)	- -	- -
	1	18 (18)	1 (1)	10 (10)	5 (5)	2 (2)
	2	18 (18)	2 (2)	8 (8)	7 (7)	1 (1)
	3	9 (9)	- -	6 (6)	1 (1)	2 (2)
	Total	46 (46)	3 (3)	25 (25)	13 (13)	5 (5)
413	1	6 (6)	- -	1 (1)	- -	5 (5)
	2	5 (5)	- -	2 (2)	- -	3 (3)
	Total	11 (11)	- -	3 (3)	- -	8 (8)
415	B	19 (19)	- -	3 (3)	- -	16 (16)
	1	40 (40)	1 (1)	7 (7)	2 (2)	30 (30)
	2	19 (19)	- -	5 (5)	- -	14 (14)
	3	4 (4)	3 (3)	1 (1)	- -	- -
	unk*	1 (0)	- -	1 (0)	- -	- -
	Total	83 (82)	4 (4)	17 (16)	2 (2)	60 (60)
416	1	12 (12)	- -	2 (2)	- -	10 (10)
	2	5 (5)	- -	- -	- -	5 (5)

*unknown

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
416	Total	17	-	2	-	15
(Cont.)		(17)	-	(2)	-	(15)
417	1	1	-	1	-	-
		(1)	-	(1)	-	-
425	1	3	-	3	-	-
		(3)	-	(3)	-	-
	2	3	1	1	-	1
		(3)	(1)	(1)	-	(1)
	Total	6	1	4	-	1
		(6)	(1)	(4)	-	(1)
426	1	1	-	1	-	-
		(1)	-	(1)	-	-
427	1	3	-	1	2	-
		(3)	-	(1)	(2)	-
428	1	1	-	1	-	-
		(1)	-	(1)	-	-
429	1	1	-	1	-	-
		(0)	-	(0)	-	-
430	2	2	-	2	-	-
		(2)	-	(2)	-	-
431	1	6	2	4	-	-
		(6)	(2)	(4)	-	-
	2	14	8	5	-	1
		(14)	(8)	(5)	-	(1)
	Total	20	10	9	-	1
		(20)	(10)	(9)	-	(1)
432	1	2	-	-	2	-
		(1)	-	-	(1)	-
	2	30	8	15	1	6
		(30)	(8)	(15)	(1)	(6)

CASUALTY STATISTICS FOR SPECIFIC PUBLIC BUILDINGS IN NAGASAKI

Bldg. No.	Floor No.	No. on Floor	Dead	Injured	Uninjured	Missing
432	Total	(32)	8	15	3	6
(Cont.)		(31)	(8)	(15)	(2)	(6)
464	unk	1	-	1	-	-
		(0)	-	(0)	-	-

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)* The Dikewood Corporation 1009 Bradbury Drive, S. E. Albuquerque, New Mexico 87106	2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED 2b. GROUP

3. REPORT TITLE

ANALYSIS OF JAPANESE NUCLEAR CASUALTY DATA

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Final report

5. AUTHOR(S) *(Last name, first name, initial)*

Davis, L. Wayne

Baker, William L.

Summers, Donald L.

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
April, 1966	326	11

8a. CONTRACT ~~OR GRANT~~ NO. OCD-PS-64-196 b. PROJECT NO. N228-(62479)69778 c. Work Unit No. 3411A d.	9a. ORIGINATOR'S REPORT NUMBER(S) DC-FR-1054 9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)* USNRDL-TRC-46

10. AVAILABILITY/LIMITATION NOTICES

Distribution of this document is unlimited.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	Office of Civil Defense Office of the Secretary of the Army Washington, D. C. 20310

13. ABSTRACT

This report summarizes the results of a detailed data reduction and casualty study made on over 35,000 persons who were subjected to the nuclear attack on Hiroshima and Nagasaki, Japan, in 1945. Both graphical and tabular presentations are made of pertinent data to show that an excellent base exists for more reliable conclusions of a wider variety than have heretofore been available.

Total mortality and total injury curves are given as well as injury curves by type (blast, thermal, and initial nuclear) for thirteen shielding categories, which includes a breakdown of seismic reinforced-concrete buildings by floor divisions. Further breakdowns of the blast and thermal injuries are also given here, but considerably greater detail will be presented in a follow-on effort directed towards predicting the medical load following a high-yield nuclear attack on the United States. The free-field weapons effects are presented for both Japanese cities to allow the association of a given effects level with a particular percent mortality or injury. Such comparisons indicate that the initial nuclear radiation played a dominant role in the deaths of thermally-shielded people in both cities.

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Casualties						
Japanese nuclear casualties						
Nuclear casualty prediction						
Urban casualty prediction						
Hiroshima, Japan						
Nagasaki, Japan						

INSTRUCTIONS

1. ORIGINATING ACTIVITY: Enter the name and address of the contractor, subcontractor, grantee, Department of Defense activity or other organization *(corporate author)* issuing the report.

2*a*. REPORT SECURITY CLASSIFICATION: Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking is to be in accordance with appropriate security regulations.

2*b*. GROUP: Automatic downgrading is specified in DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also, when applicable, show that optional markings have been used for Group 3 and Group 4 as authorized.

3. REPORT TITLE: *Enter the complete report title in all* capital letters. Titles in all cases should be unclassified. If a meaningful title cannot be selected without classification, show title classification in all capitals in parenthesis immediately following the title.

4. DESCRIPTIVE NOTES: If appropriate, enter the type of report, e.g., interim, progress, summary, annual, or final. Give the inclusive dates when a specific reporting period is covered.

5. AUTHOR(S): Enter the name(s) of author(s) as shown on or in the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.

6. REPORT DATE: Enter the date of the report as day, month, year; or month, year. If more than one date appears on the report, use date of publication.

7*a*. TOTAL NUMBER OF PAGES: The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.

7*b*. NUMBER OF REFERENCES: Enter the total number of references cited in the report.

8*a*. CONTRACT OR GRANT NUMBER: If appropriate, enter the applicable number of the contract or grant under which the report was written.

8*b*, 8*c*, & 8*d*. PROJECT NUMBER: Enter the appropriate military department identification, such as project number, subproject number, system numbers, task number, etc.

9*a*. ORIGINATOR'S REPORT NUMBER(S): Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.

9*b*. OTHER REPORT NUMBER(S): If the report has been assigned any other report numbers *(either by the originator or by the sponsor)*, also enter this number(s).

10. AVAILABILITY/LIMITATION NOTICES: Enter any limitations on further dissemination of the report, other than those imposed by security classification, using standard statements such as:

(1) "Qualified requesters may obtain copies of this report from DDC."

(2) "Foreign announcement and dissemination of this report by DDC is not authorized."

(3) "U. S. Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through ________________."

(4) "U. S. military agencies may obtain copies of this report directly from DDC. Other qualified users shall request through ________________."

(5) "All distribution of this report is controlled. Qualified DDC users shall request through ________________."

If the report has been furnished to the Office of Technical Services, Department of Commerce, for sale to the public, indicate this fact and enter the price, if known.

11. SUPPLEMENTARY NOTES: Use for additional explanatory notes.

12. SPONSORING MILITARY ACTIVITY: Enter the name of the departmental project office or laboratory sponsoring *(paying for)* the research and development. Include address.

13. ABSTRACT: Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.

It is highly desirable that the abstract of classified reports be unclassified. Each paragraph of the abstract shall end with an indication of the military security classification of the information in the paragraph, represented as *(TS)*, *(S)*, *(C)*, *or (U)*.

There is no limitation on the length of the abstract. However, the suggested length is from 150 to 225 words.

14. KEY WORDS: Key words are technically meaningful terms or short phrases that characterize a report and may be used as index entries for cataloging the report. Key words must be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location, may be used as key words but will be followed by an indication of technical context. The assignment of links, roles, and weights is optional.